CIVIL DEFENSE FOR NATIONAL SURVIVAL

(PART 1—Testimony of Dr. Willard F. Libby, Dr. Albert G. Hill, Dr. Lloyd V. Berkner, Willard Bascom, Dr. Merle A. Tuve, and Dr. James R. Killian, Jr.)

HEARINGS

BEFORE A

SUBCOMMITTEE OF THE COMMITTEE ON GOVERNMENT OPERATIONS HOUSE OF REPRESENTATIVES

EIGHTY-FOURTH CONGRESS

SECOND SESSION

JANUARY 31, FEBRUARY 1, 7, 8, AND 9, 1956

Printed for the use of the
Committee on Government Operations

CIVIL DEFENSE FOR NATIONAL SURVIVAL

(PART 1—Testimony of Dr. Willard F. Libby, Dr. Albert G. Hill, Dr. Lloyd V. Berkner, Willard Bascom, Dr. Merle A. Tuve, and Dr. James R. Killian, Jr.

HEARINGS

BEFORE A

SUBCOMMITTEE OF THE COMMITTEE ON GOVERNMENT OPERATIONS HOUSE OF REPRESENTATIVES

EIGHTY-FOURTH CONGRESS

SECOND SESSION

JANUARY 31, FEBRUARY 1, 7, 8, AND 9, 1956

Printed for the use of the
Committee on Government Operations

UNITED STATES
GOVERNMENT PRINTING OFFICE
72796 WASHINGTON : 1956

COMMITTEE ON GOVERNMENT OPERATIONS

WILLIAM L. DAWSON, Illinois, *Chairman*

CHET HOLIFIELD, California
JOHN W. McCORMACK, Massachusetts
EARL CHUDOFF, Pennsylvania
JACK BROOKS, Texas
LESTER HOLTZMAN, New York
ROBERT H. MOLLOHAN, West Virginia
L. H. FOUNTAIN, North Carolina
PORTER HARDY, JR., Virginia
JOHN A. BLATNIK, Minnesota
ROBERT E. JONES, Alabama
EDWARD A. GARMATZ, Maryland
JOHN E. MOSS, California
JOE M. KILGORE, Texas
DANTE B. FASCELL, Florida
MARTHA W. GRIFFITHS, Michigan
HENRY S. REUSS, Wisconsin

CLARE E. HOFFMAN, Michigan
R. WALTER RIEHLMAN, New York
CECIL M. HARDEN, Indiana
CHARLES B. BROWNSON, Indiana
GEORGE MEADER, Michigan
CLARENCE J. BROWN, Ohio
GLENARD P. LIPSCOMB, California
B. CARROLL REECE, Tennessee
J. ARTHUR YOUNGER, California
VICTOR KNOX, Michigan
OTTO KRUEGER, North Dakota
CHARLES R. JONAS, North Carolina
WILLIAM E. MINSHALL, Ohio

CHRISTINE RAY DAVIS, *Staff Director*
ORVILLE S. POLAND, *General Counsel*
WILLIAM PINCUS, *Assistant General Counsel*
HELEN M. BOYER, *Minority Professional Staff*

MILITARY OPERATIONS SUBCOMMITTEE

CHET HOLIFIELD, California, *Chairman*

EDWARD A. GARMATZ, Maryland
JOE M. KILGORE, Texas
DANTE B. FASCELL, Florida
MARTHA W. GRIFFITHS, Michigan

CLARE E. HOFFMAN, Michigan
R. WALTER RIEHLMAN, New York
GLENARD P. LIPSCOMB, California

MEMBERS EX OFFICIO

WILLIAM L. DAWSON, Illinois
CLARE E. HOFFMAN, Michigan

MICHAEL P. BALWAN, *Staff Director*
HERBERT ROBACK, *Director of Investigations*
JAMES F. ECKHART, *Assistant Counsel*
EARL J. MORGAN, *Investigator*
ROBERT J. MCELROY, *Investigator*
CAREY BREWER, *Legislative Reference Service, Library of Congress*

CONTENTS

APPENDIX

CIVIL DEFENSE FOR NATIONAL SURVIVAL

TUESDAY, JANUARY 31, 1956

HOUSE OF REPRESENTATIVES,
MILITARY OPERATIONS SUBCOMMITTEE,
COMMITTEE ON GOVERNMENT OPERATIONS,
Washington, D. C.

The subcommittee met, pursuant to call, in room 1501, House Office Building, at 10:05 a. m., Hon. Chet Holifield (chairman of the subcommittee) presiding.

Members present: Representatives Holifield (presiding), Dawson, Kilgore, Griffiths, Riehlman, and Lipscomb.

Also present: Michael P. Balwan, staff director; Herbert Roback, director of investigations; and Carey Brewer, Legislative Reference Service, Library of Congress.

Mr. HOLIFIELD. The subcommittee will be in order.

The Military Operations Subcommittee today opens its hearings on civil defense. The hearing today is the beginning of what I expect will be many sessions with a great many informed and competent witnesses in both the broad area and the specific details of providing for an adequate civil-defense program for the United States.

There is a widespread belief in this country that civil defense is either futile against sudden massive assaults with nuclear weapons, or is hopelessly inadequate under present arrangements. Whichever is the case, the members of this subcommittee are convinced that it is about time that the people of this Nation are informed and an intelligent course of action formulated.

If it is futile to set up a civil-defense system, the people should know about it now and further expenditures should be curtailed. If civil defense offers a hope for the people of this country in terms of survival from bomb damage and in terms of adding an additional deterrent to attack upon us, then the people should be assured that adequate arrangements are being made for that purpose.

At this point, the subcommittee believes that effective civil-defense measures can be taken if the need for them is sufficiently understood by the public, if they are financially supported by the Congress and if they are courageously administered by the Executive.

It has long been my view that civil defense should be considered as an integral part of our national defense. So long as we live in the shadow of world conflict with atomic-hydrogen weapons, there is no alternative to strong national defense, including protective measures to reduce loss of life and suffering and to maintain the national economy in the event of enemy attack.

One might say that public apathy, congressional indifference, and bureaucratic inertia are the three great obstacles to effective civil

Following the passage of the shock wave at this point 18 miles away, a 50-mile-an-hour wind would blow outward for a few seconds. After this the wind would stop and a gentler inward flowing wind would follow it.

The shock wave and accompanying dynamic pressure would take out all windows, do light damage to window frames, doors, moderate plaster damage, and generally wreck weak structures.

Mr. HOLIFIELD. That is at 18 miles distant?

Dr. LIBBY. Yes, sir.

Mr. HOLIFIELD. And the degree of damage would increase in intensity as you went nearer to ground zero?

Dr. LIBBY. Yes, sir. Very much so.

In fact, to illustrate: At 12 miles distance, very severe damage would occur; whereas, the kiloton bomb used on Hiroshima created damage of this degree of severity up to a distance of 1½ miles, the distance with a 10-megaton weapon would be 12 miles.

Steel-frame buildings would suffer severe structural damage at between 9 and 10 miles, and reinforced concrete buildings with 10-inch walls and 6-inch floors would collapse at 3.2 miles.

In order to interpret this type of damage to buildings in terms of casualties to people, we estimate that for severe damage to 2-story brick structures, 85 percent of the people would be killed outright and the rest of them would receive sufficiently serious injury to require hospitalization.

In other words, for distances of 12 miles from ground zero for a 10-megaton weapon, casualty figures of this sort may be expected to apply to people at that time inside of such houses and structures, and at a distance of 3 miles, we may expect 100 percent casualties for people inside reinforced concrete buildings of normal 10-inch walls and 6-inch floors.

These damage figures are given in a table in this statement.

Air-blast damage to structures, based on Japanese experience

Damage	Distance from ground zero (miles) [1]		
	10 megatons	5 megatons	20 kilotons
Light damage to window frames and doors, moderate plaster damage, complete window damage	18.5	14.5	2.3
Moderate damage to homes. Severe fire damage expected. Flash ignition of dry, combustible materials	15.0	12.0	1.9
Severe damage to homes. Heavy damage to window frames and doors	12.0	9.5	1.5
Severe structural damage to steel-frame buildings	9.6	7.6	1.2
18-inch brick walls completely destroyed	6.4	5.1	.8
Collapse of reinforced concrete building, 10-inch walls, 6-inch floors	3.2	2.5	.4

[1] Estimated.

Now, we might turn to the second general type of fact, namely, the thermal damage.

The thermal radiation and the burning effects of atomic weapons are entirely due to the great radiating power of the hot fireball. The fireball develops to full size in the time of a few seconds, the rate and ultimate size depending greatly on the yield of the weapon.

For example, a 20-kiloton weapon would develop a fireball about 900 feet in diameter; whereas, the fireball of a 10-megaton weapon

Dr. LIBBY. Now, the radioactivity, the fallout which is left in the troposphere where rain occurs, is washed down in the matter of days or weeks. We know, for example, that a 10th of an inch of ordinary rain will remove most atomic matter in the air except for the very smallest material.

In other words, for a 10th of an inch of rainfall, it would be quite certain that the area between the air and the ground would be washed essentially clear of fallout material.

Mr. HOLIFIELD. But that material would then be deposited on the earth?

Dr. LIBBY. Yes, sir. In the raindrops.

Now, there may be a minute fraction which might get out of the way of the raindrops as the air gets out of the way, but this tiniest fraction is likely also to be precipitated because it migrates around, being so small, and it may attach itself to other dust particles, and so it would be rained out itself.

For these reasons, tropospheric radioactive fallout doesn't stay in the atmosphere for more than a matter of weeks, at the outside. It may make 2 or 3 trips around the earth and because of the short time, it doesn't have much chance to move out of the latitude in which it originated, so it will be deposited in the same general latitude.

Mr. HOLIFIELD. And it is possible to pick up on delicate instruments those trips around the earth a second and third time?

Dr. LIBBY. Yes, sir. Of course, it decreases very rapidly due to the increased age of the material and the fact that it falls out as it goes around.

Mr. HOLIFIELD. Of course, this is one of the basic scientific reasons why we can pick up explosions in other countries and know when they occur and estimate as to what type explosions they are?

Dr. LIBBY. Yes, sir. Atomic weapons fired in the air can be picked up by fallout.

Mr. HOLIFIELD. Yes.

Dr. LIBBY. Now, this is in very sharp contrast to the fallout material which is placed in the stratosphere which appears to stay there for a matter of years. We don't have very good figures for this, but it looks like 10 years might be a pretty good average.

We must bear in mind, however, that this is based on the nature of the material carried up in the clouds that we have had to work with, but our present experience indicates that the fallout from these large weapons which does not occur immediately—that is, the material which falls out immediately within the first few hundred miles is not the material which generally goes into the stratosphere, though big lumps may be thrown into the stratosphere and fall right back down.

The fraction which falls out locally is on large particles. The fraction which does not fall out quickly and goes into the stratosphere is deposited at a very slow rate corresponding, perhaps, to an average time in the stratosphere of about 10 years.

As a result of this long residence time in the highest layers of the atmosphere, the winds mix and distribute the radioactive material broadly over the earth and one finds when the fallout does finally find its way down into the troposphere and come down to the earth, that its rates of precipitation are relatively uniform.

There is a banding around the middle where the firing occurred which confined it even in the South Pole. Thus, we see that the local

Without objection, those tables will be inserted at this point, as it is on this subject.

(The material referred to follows:)

[Reprinted from Science, vol. 122, No. 3158, July 8, 1955]

Dosages From Natural Radioactivity and Cosmic Rays

By W. F. Libby[1]

The radiation dosages that people receive from the natural radioactivities and cosmic rays have ben calculated and are given in tables 1, 2, 3, and 4. Some direct observations are given in table 5.

Table 1 gives the dosages in milliroentgens per year for exposures at various altitudes directly over ordinary granite, typical sedimentary rock, and open oceans. Surface dosages decrease with height above the ground because of air absorption; 50-percent reduction occurs for every 370 feet (1). For comparison purposes, it is interesting to note that in the United States, the average exposure rate from total fallout from atomic tests on Jan. 1, 1955, was about 1 mr/yr (2). The total dose during 1954 probably averaged about 15 mr (2), principally because of the Pacific tests in the spring.

Table 1.—*Total radiation dosages from normal background radiation (mr/yr)*

Altitude of ground surface	Ordinary granite		Typical sedimentary rock		Open ocean	
	Equator	55°N	Equator	55°N	Equator	55°N
Sea level	143	147	76	80	53	57
5,000 feet	150	170	83	103	----------	----------
10,000 feet	190	230	123	163	----------	----------
15,000 feet	270	350	203	283	----------	----------
20,000 feet	414	560	347	493	----------	----------

The values listed in table 1 were calculated on the following basis. The roentgen was taken to be 100 ergs of energy per gram of water. (Actually this definition is that of the rad, the internationally recognized unit of radiation dosage. For gamma rays it is nearly equal to the roentgen, which is 93 ergs per gram. The absorption coefficients of all radiations in tissue were taken as being equivalent to those of water. The dosages from the natural radioactivities in the earth were calculated on the approximation that the energy absorbed per gram by the human body on the surface of the earth is, to a sufficient approximation, equivalent to that absorbed per gram by the top layers of the rock of the earth's surface itself from the gamma radiation emitted by the rock (3). In other words, the total gamma-ray energy produced in a gram of granite from the thorium, uranium, and potassium contained was taken to be equal to the energy absorbed per gram of human tissue in the human body on the surface, except that a factor of 2 was used to correct for the geometric loss. It was interesting to observe that this simple method of calculation gave results in good agreement with those based both on separate consideration of each of the complicated radiations emitted by thorium and uranium in the rocks and on the use of the individual absorption coefficients for these radiations in tissue, together with correction for the "build-up" factors as the radiation is scattered and diffuses out of the rock (4).

The abundances of uranium, thorium, and potassium in granite were taken as 4×10^{-6} g/g (1), 13×10^{-6} g/g (1), and 0.03 g/g, respectively (1). In selecting these numbers, it was realized that these were only averages and that fluctuations around these values do occur, that uranium contents as high as 200 parts per million have been found in granite, and that thorium has been found as abundant as 500 parts per million in some granites.

For sedimentary rocks, the general average figure of one-fourth of the values quoted for granites has been used. It is realized, however, that this is very ap-

[1] The author is a member of the U. S. Atomic Energy Commission.

proximate, because the amounts of the various radioactive minerals in the sedimentaries fluctuate widely. The abundances of uranium and potassium in sea water were taken, respectively, as 1.3×10^{-9}g/g(1) and 3.5×10^{-4}g/g(1). The abundance of potassium in the human body was taken as 2×10^{-3} g/g(5), and the abundance of carbon in the human body was taken as 18 percent. For the calculation of the dosage from radium assimilated in drinking waters throughout the normal lifetime, the bone weight was taken as 10 percent for the adult man. But for relatively brief periods of assimilation when the radium would be expected to be concentrated in the small volumes of the bone most metabolically active, the figure of 1 percent was used. All these numbers on the human body were taken as being equivalent to those of the "standard man" (6).

The dosages resulting from cosmic radiation were calculated from the ionization chamber data of Millikan et al. (7). From these data the dosages were calculated at altitudes up to 20,000 feet and at the latitude of 55° N. (geomagnetic) as well as at the geomagnetic equator. The results are given in table 2. It should be mentioned that the biological effects per unit energy may be larger for cosmic radiation, because it consists of high-energy particles rather than gamma radiation.

TABLE 2.—*Cosmic ray dosages*

Altitude:	*Dosages (mr/yr)*
Sea level	33 to 37
5,000 feet	40 to 60
10,000 feet	80 to 120
15,000 feet	160 to 240
20,000 feet	300 to 450

The natural radioactivity in the human body contributes the dosages given in table 3. Of the 19-mr/yr dosage from potassium, 17 mr/yr is from the beta rays of the potassium itself. These were taken to be of a mean energy 40 percent of the maximum energy of 1.36 Mev. The specific activity of natural potassium was taken as 1,800 beta rays per gram, per minute and 180 gamma rays of 1.45-Mev energy per gram, per minute (8). The gamma rays that contribute the remaining two units of the dosage of potassium were calculated on the basis of the assumption that only half of the gamma-ray energy is actually absorbed in the body. This leads to the result that in a packed crowd the radioactivity from the potassium in one's neighbor's bodies contributes an additional dosage of 2 mr/yr.

TABLE 3.—*Radiation dosages from the natural radioactivity of the human body*

Source of radioactivity:	*Dosage (mr/yr)*
Potassium	19
Carbon	1.5
Radium (bones only), uniform distribution	6.7
Radium (bones only), nonuniform distribution	[1] 67

[1] The radium content of the human body is based on data of A. F. Stehney of Argonne National Laboratory.

The dosage from carbon was calculated on the basis of the assumptions that the body is 18-percent carbon; the specific radioactivity of carbon is 15 disintegrations per gram, per minute (9); and that the mean energy of the beta radiation is 40 percent of the maximum energy of 167 kev (8).

In table 4, various ordinary but somewhat unusual circumstances are used to illustrate the types of exposure that can occur in normal living. A wrist watch worn 24 hours per day that has a luminous dial assumed to have 1 μc of radium per watch—a figure perhaps slightly larger than the average—would give the central body, including the sex organs, a dosage of about 40 mr/yr. An airplane pilot flying 24 hours per day with an instrument panel consisting of 100 dials with 3 μc of radium each would receive, at an average distance of 1 yard, a dosage of 1300 mr/yr.

TABLE 4.—*Radiation dosages in various ordinary circumstances*

Radiation source	Location	Dosage (mr/yr)
Wrist watch (1 μc of Ra per watch)	Central body, including sex organs, at average distance of 1 foot.	40.
Luminous dials in airplane cabin (100 dials with 3 μc of Ra each).	Pilot is taken to be at an average distance of 1 yard from the dials.	1,300.
X rays (10)	Lumbar spine, anterior posterior	1,500 each.
	Lumbar spine, lateral	5,700 each.
	Pregnancy, anterior posterior	3,600 each.
	Pregnancy, lateral	9,000 each.
Uranium ore (0.1 percent—the minimum accepted by the AEC for purchase).	Flat surface ground	2,800.
	Mine with all walls of ore	5,600 (neglecting radon).
Phosphate rock (commercial fertilizer 0.01 to 0.025 percent U).	Flat surface ground	280–700.
People	Packed in crowd	2.

In order to check whether the dosages calculated here and given in tables 1 to 4 are essentially correct, some direct measurements reported by various observers are given in table 5. They agree reasonably well with the external component of the total dosages given for sea level in table 1—the residues after subtracting 20.5 mr/yr, the dosage from body radioactivities given in table 3.

TABLE 5.—*Experimental data for hard background radiation (mr/yr)* [1]

Observer	Cosmic rays	Gamma rays		Cosmic and gamma rays (total)	Location
		From air	From ground		
Sievert and Hultquist	44			121–150	Streets of Stockholm.
				104–182	Over igneous rocks, Sweden.
				94	Clay soil (11).
				104	Wood houses (average center of room).
				145	Brick and concrete houses (types 1, 2) (11).
				296 (max., 520)	Brick and concrete houses (type 3) (11).
Cowan				98	Outdoors, Brookhaven, N. Y., measured (12).
Hess and Vancour	34	2	53	90	Outdoors, Fordham University campus, New York, 1 mile above ground (13).
Burch	31–34		62	94–96	Leeds, England (14).

[1] Kindly collected by L. D. Marinelli of Argonne National Laboratory.

It is interesting that the variations in natural dosage are large and under certain conditions the natural dosage may be nearly 100 times higher than the minimum—the dosage of seafarers. The fallout dosage rate in the United States on January 1, 1955—1 mr/yr—was only 2 percent of this lowest natural dosage rate. Of course, during a test period when bombs are fired, the fallout dosage rates may approach, or somewhat exceed, the natural dosage rate for a few days before decay and weathering processes reduce them in a few weeks to rates that are small percentages of the natural background.

REFERENCES AND NOTES

1. H. Faul, *Nuclear Geology* (Wiley, New York, 1954).
2. M. Eisenbud and J. H. Harley, *Science* 121, 677 (1955).
3. This calculation was kindly suggested by L. D. Marinelli of Argonne National Laboratory.
4. U. Fano, *Nucleonics* 11, No. 8, 8 (1953); 11, No. 9, 55 (1953).
5. L. D. Marinelli, private communication.
6. "Recommendations of the International Commission on Radiological Protection," *NBS Handbook No. 47* (1950), p. 16.
7. R. A. Millikan and H. V. Neher, *Phys. Rev.* 50, 15 (1936); H. V. Neher and W. H. Pickering, *ibid.* 61, 407 (1942).

72796—56—pt. 1——4

8. "Nuclear Data," *Natl. Bur. Standards U. S. Circ. 499* (1950), suppl. 1, 2, and 3.
9. W. F. Libby, *Radiocarbon Dating* (Univ. of Chicago Press, Chicago, 1952).
10. A. H. Sturtevant, "Genetic effects of high-energy irradiation of human population," address given Jan. 11, 1955 at California Institute of Technology.
11. R. M. Sievert and B. Hultquist, "Variation in natural gamma radiation in Sweden," *Acta Radiol.* 37, 388, 399 (1952).
12. F. P. Cowan, "Everyday radiation," *Phys. Today* 5, No. 10, 10 (1952); also AECU-1138.
13. V. F. Hess and R. P. Vancour, "Ionization balance of the atmosphere," *J. Atm. and Terrest. Phys.* 1, 13 (1950).
14. P. R. J. Burch and F. W. Spiers, "Radioactivity of the human being," *Science* 120, 719 (1954); P. R. J. Burch, "Cosmic radiation," *Proc. Phys. Soc. London* A67, 421 (1954).

Dr. LIBBY. Mr. Chairman, on this instrument question, if you think it would be helpful to the committee, we would be pleased to bring down and show the committee the instruments. That might be helpful to you, to see them.

Mr. HOLIFIELD. We would like to have it. Will you send some samples up to the committee and also some radioactive material to indicate the manner in which they work for tomorrow morning's meeting, and we will gather about 10 or 15 minutes earlier and have your best man come down and demonstrate them to us.

Dr. LIBBY. We would be pleased to do so.

Mr. HOLIFIELD. And if so, at that time we would like to have approximate prices. We don't mean to pin you down to the prices and ask you to deliver them for that.

Dr. LIBBY. I note here there is a bulletin from the FCDA of January 18 saying that the FCDA today pushed ahead its program to protect Americans from fallout hazard with the announcement that they are planning to purchase $3½ million worth of radiation detection instruments.

That is the largest purchase order in history. It will permit the FCDA to buy for its stockpiles for distribution to States for training purposes 60,000 survey meters to measure radiation rate and 150,000 dosimeters—those are things you put in your pocket—and accessory equipment.

Mr. CORSBIE. Mr. Chairman, I would like to add this to the matter of AEC–FCDA cooperation on instrumentation.

It isn't limited to the low-cost type of instrument. Over the recent past field tests, we have developed methods of monitoring ground and water areas from the air with instruments mounted aloft.

In trying to determine the dimensions of fallout areas such as described by Dr. Libby, this seems to be to us a possible way of a fast determination of the area of principal hazard and of possible use to civil defense.

We put on a training exercise at the Nevada test site from October 17 to 21, 1955, with the Federal Civil Defense Administration designating those to attend for the purpose of becoming familiar with the state of development with the equipment and to determine themselves whether or not this was useful in their civil-defense planning.

Mr. HOLIFIELD. Thank you.

Now, you gave us in your last page here a matter of some simple items which you thought the public should know to protect themselves. Do you have the feeling that the general average American knows these things at the present time?

Dr. LIBBY. I am afraid my opinion is that they do not know them well enough. These things require some kind of instruction. That is, you have to have an instrument in your hand and put it near some radioactivity and see how it responds and get some feeling of the thing.

That is, you might be able to conduct a poll and find that people could answer the questions pretty well, but I am afraid this still isn't enough.

They have to know it well enough so that under conditions of stress and possibly even panic, they could do it, and so I think more training is needed.

Mr. HOLIFIELD. And your second requirement that radiation instruments to measure this fallout radiation should be available throughout the country and people know how to use them, as far as you know, that condition does not exist at this time?

Dr. LIBBY. Not yet, though we are making good progress, I believe.

Mr. HOLIFIELD. Mr. Riehlman.

Mr. RIEHLMAN. Right along that very same line, which ties in with your questioning, you stressed on several occasions during your testimony today, Doctor, the importance of the American people knowing just as many things to do to protect themselves.

How well do you feel that they are informed at this time of those things they can do to protect themselves?

Dr. LIBBY. Well, I would reply as I did to the chairman's question. I think perhaps if you conducted a poll, you might find they know quite a little bit as far as answering questions, but I am afraid they don't know it well enough.

Mr. RIEHLMAN. You feel, then, that it is very important at this time that a very strong program of information and education be set up in the Federal civil defense organization to inform the American people of what they can do?

Dr. LIBBY. Yes, sir.

Mr. RIEHLMAN. And should prepare to protect themselves?

Dr. LIBBY. Yes, exactly.

Mr. HOLIFIELD. Do you feel that this subcommittee is justified in its interest, and also in its concern in regard to this problem?

Dr. LIBBY. I certainly do, Mr. Chairman. I believe the hearing you are conducting will be most important in giving a body of information which anyone can read from and refer to, and I am so happy to know about your plans.

I think this is a very important move in the educational program.

Mr. HOLIFIELD. This is not going to be a 3-day stand, you know. We are going into this thing thoroughly.

Dr. LIBBY. I understand that, sir, and I am most happy to learn it.

Mr. HOLIFIELD. I have a few questions which are basic, which I think we ought to have on the record, if possible.

Your release, the Atomic Energy Commission release of February 15, defined the area of serious fallout from the March 1, 1954, superbomb explosion as roughly 7,000 square miles. Do you regard this as a good planning figure for civil defense?

Dr. LIBBY. Well, it depends on how the winds blow and on conditions of firing. I wouldn't know how to give you a better figure, but I wouldn't want to leave the impression that there is anything magic about this particular area.

Mr. HOLIFIELD. It could be less, according to the size of the bomb and the weather conditions, or it could be larger?

Dr. LIBBY. Yes, sir.

Mr. HOLIFIELD. But at least it is a medium area that we know from a practical explosion that there is this area of danger.

Dr. LIBBY. Yes, sir.

Mr. HOLIFIELD. And a pattern of danger can follow?

Dr. LIBBY. Yes, sir.

Mr. HOLIFIELD. And that, as I remember, was in the very best of weather. Sunshiny and clear, without rainfall.

Dr. LIBBY. Well, I wasn't there.

Dr. DUNHAM. There was certainly not a storm condition. I think it was fairly standard weather for that general area.

Mr. HOLIFIELD. I know the tests were postponed at different times because of prevailing wind or the wrong kind of atmospheric conditions, and the search was for an atmospheric condition which would be the safest and not for an atmospheric condition that might do the most harm.

Dr. LIBBY. Exactly; that is right.

Mr. HOLIFIELD. So when we look upon this figure, we should take those things into consideration.

Dr. LIBBY. That is right.

Mr. HOLIFIELD. Assuming that we use this figure, just for purposes of further questioning, of 7,000 square miles of fallout area, how much of this area do you think would be contaminated to the point where human beings would have to stay out of it for an appreciable length of time?

Can you answer that or not, as an estimate, in square miles?

Dr. LIBBY. I could answer it, but I am afraid I will have to look at the report again. I believe it would be something like one-third of the area.

Would you agree with that Dr. Dunham?

Dr. DUNHAM. Yes, that would be about it.

Dr. LIBBY. I think that is about right.

Mr. HOLIFIELD. One-third of the 7,000 square miles, then, would, in your opinion, be so contaminated that human beings would be wise to stay out of that area for a number of days, and possibly weeks, and months, near the center.

Dr. LIBBY. Well, you see, sir, during the initial period, I am not certain that evacuation is possible.

Mr. HOLIFIELD. Yes.

Dr. LIBBY. It is so hot—or it could be so hot that it is best to stay in your cellar or some place.

Mr. HOLIFIELD. Yes.

Dr. LIBBY. Then, following that you might want to leave or take some other such measures, and I think that probably something like a third of this particular area.

Mr. HOLIFIELD. But at least if you were outside of it, you wouldn't want to go back in without proper radioactive monitoring.

Dr. LIBBY. Yes; and you want to watch and be sure that it is low enough for you to go back.

Mr. HOLIFIELD. Assuming you were 100 miles downwind and were adequately sheltered, what would the wisest course be—to remain under shelter for several hours, or to emerge very soon thereafter?

Dr. LIBBY. Well, I would think you ought to stay in the shelter until the radiation level is low enough for you to travel safely. That depends on the way the wind is blowing and the way the fallout actually occurs. Here is where you need your instruments, and your guidance over your radio to tell you what the countryside is like and just good advice on what you should do.

Mr. HOLIFIELD. Now, if the enemy should attack us, it would be reasonable to assume that there would be a number of bombs dropped at one time, if they could deliver them.

There would be very little from a defense standpoint to be gained by dropping 1 or 2 bombs, and there would be an attempt, undoubtedly, to deliver more than 1, or several, and if this did occur, there might be overlapping areas of fallout which would be doubly exposed, or triply exposed, would there not?

Dr. LIBBY. It could be very well.

Mr. HOLIFIELD. The concept of a target area cannot be confined under the circumstances of this type of weapon explosion to the geographical boundaries of a city or county or necessarily a State?

Dr. LIBBY. No; it cannot be confined to the area we were speaking of this morning, in the blast and the thermal area.

Mr. HOLIFIELD. In other words, the hazard area—and the reason I ask you this is the 1950 Civil Defense Act puts the responsibility upon city officials, county officials, and State officials, to do the job of preserving the lives of their inhabitants—now, this was, of course, legislation which Congress passed before the advent of the hydrogen weapon.

The point of my question is that that legislation must, of necessity, be obsolete in view of the fact that the target area is now larger than the political subdivisions upon which responsibility was placed at that time.

Dr. LIBBY. It is certainly true that the fallout area can reach across boundary lines of States and cities.

Mr. HOLIFIELD. Now, if there is going to be adequate civilian defense in an area for the inhabitants of that target area, we must have a complete civil-defense effort in that area and a complete and coordinated planning in that area, must we not?

Dr. LIBBY. It certainly must be coordinated; yes, sir.

Mr. HOLIFIELD. And if we have, say, 5 cities that happen to be in a target area, and 3 of those cities take measures for self-defense and the other 2 do not, we do not have a maximum civil-defense effort in that area, and therefore, the areas that do not take the same precautions would become a danger to those even who do, would they not?

Dr. LIBBY. It would seem to me so, sir, though I must emphasize that this is somewhat out of AEC's purview, but it certainly seems to me that that is correct.

Mr. HOLIFIELD. Well, we seek your good judgment on this matter as a scientist, and if our deductions seem to be out of line with your knowledge of the scientific impact of these weapons on populations and areas, then we would, of course, respectfully ask you to tell us so.

Dr. LIBBY. Well, it seems to me that the statement you have made is a reasonable one from what I know of the effects.

Mr. HOLIFIELD. Would you care to state to this committee whether you are—as a scientist, and as a member of the Atomic Energy Com-

mission, as well—are convinced that there has been a hydrogen explosion within the Soviet Union?

Dr. LIBBY. I would say we believe—I could say there has been; yes, sir.

Mr. HOLIFIELD. Has the Atomic Energy Commission informed its own personnel as to the action they should take in the event of attack?

Dr. LIBBY. We are in process of doing just that, and to study what measures we should take to keep our plants operating and to perform our functions. It is a large order, and we have, as I said this morning, our own little civilian defense problem right in our own operations.

Mr. HOLIFIELD. Well, that is why I brought that up, because I know that there are approximately 29,000 people employed at Oak Ridge in the atomic facilities there and approximately 18,000 or 20,000 in Hanford, and I am not aware at this time of how many at Savannah and other places.

And so you have a tremendous population, or tremendous group of employees, and in many instances they are in proximity to a great deal of this material, and if those facilities should be targets—and it is reasonable to suppose that they might be considered a military target—and if you believe that this is a serious matter, it would seem to me that you should be taking measures to protect those employees to the best extent possible.

Dr. LIBBY. We have these plans, and, of course, we hope for, through cooperation with the FCDA to get help, but we hope to gain not only protection of our own installations, but by doing these things, to learn things which will be useful to the FCDA, too.

And we are trying to do just that.

Mr. HOLIFIELD. A few years ago I asked the members of the Joint Chiefs of Staff if they had at that time prepared an alternative Pentagon, and my question was a casual one.

I had no idea that I would get a "no" answer, but I got a "no" answer. Since that time I understand that that has been corrected. In fact, it has been placed—there are articles that have appeared in our local press to that effect.

Now, I am going to ask you this question: If the headquarters of the Commission should be destroyed, has your Commission been farsighted enough to plan alternate facilities to carry on the work of your agency?

Dr. LIBBY. The answer is "Yes."

Mr. HOLIFIELD. I am glad to hear that.

I understand from the papers that we are going to have a new AEC headquarters in Germantown, Md.

Dr. LIBBY. Yes, sir; that is true.

Mr. HOLIFIELD. And I would like to ask you if, in the construction of those facilities you are taking into consideration protection, blast pressure against the walls and ceilings, and so forth, in the construction of those buildings?

Dr. LIBBY. We are, sir; yes, sir.

Mr. HOLIFIELD. And adequate underground shelters or shelters which will in your opinion protect your people?

Dr. LIBBY. Do you know, Dr. Dunham, about that?

Dr. DUNHAM. Yes. There are shelter areas planned for the new building.

Mr. HOLIFIELD. Are those shelter provisions adequate if point zero happened to be Washington, D. C.?

Dr. DUNHAM. If point zero were Washington, D. C., they are believed to be adequate, sir.

Mr. HOLIFIELD. Point zero happened to be between Germantown and Washington, D. C. I am speaking now of blast and thermal. Do you think they would be adequate?

Dr. DUNHAM. Yes; I believe they would.

Mr. BALWAN. Are the specifications and design of the AEC Building at Germantown unique in any special way by virtue of Atomic Energy's own knowledge of weapons' effect?

Dr. LIBBY. Well, the architects certainly have instructions to look to the points that the Chairman mentioned in designing the building, and in this sense; yes.

Mr. BALWAN. There is no information which AEC has and which it has passed on to its architects which might not be available, to let us say, the CIA, or the new House Office Building, if they wanted to take care of something like that?

Dr. LIBBY. No; there isn't any information that isn't available to any other agency.

Mr. BALWAN. People would not consider that just because it is AEC they are better protected than anybody else.

Mr. LIBBY. Oh, no; we did move out to Germantown.

Mr. HOLIFIELD. Well, they can't all move out to Germantown; some of us are going to have to stay here I am afraid and pass legislation and appropriations so you fellows can move out there.

Are the AEC scientists and technicians at the various sites encouraged to cooperate with local civilian defense organizations?

Dr. LIBBY. Yes, sir; in anyway they can.

Mr. HOLIFIELD. You can tell us that cooperation has been achieved in those areas.

Dr. LIBBY. I am sorry, Mr. Corsbie had to leave to catch a train, but I believe this is so throughout the whole organization.

Dr. DUNHAM. All the area offices have one man who is responsible for liaison in working out joint plans.

Mr. HOLIFIELD. If you happened to be in a fallout region and you were a civil-defense adviser or official, could you suggest a reasonable or allowable limit of dosage for an adult in the first month of exposure?

Dr. LIBBY. I will have to refer that to Dr. Dunham, I am afraid.

Mr. HOLIFIELD. That could be executed, could it not, Dr. Dunham?

Dr. DUNHAM. It depends upon what you are weighing it against, Mr. Chairman, what other hazard the individual might be exposed to. You could allow a person to take 300 roentgens if he had a better than 50–50 chance of dying if he didn't take the 300 roentgens. You see what I am getting at. There is no absolute figure. You have to weigh it.

Mr. HOLIFIELD. I see. It is a matter of calculation as to the hazards that he would encounter in removing himself from the area?

Dr. DUNHAM. That is right.

Mr. HOLIFIELD. And would the dosage be different for children? Would they be more susceptible than adults?

Dr. DUNHAM. Slightly, but not much more so.

Mr. HOLIFIELD. I think we touched on the drinking water this morning of a city, the possible contamination from fallout?

Do you look upon that as a factor of quite a bit of concern to civilian defense people?

Dr. DUNHAM. Well, I would say that (1) you can get along without water for a day or two; (2) you can tolerate amounts of radioactivity in the water which are well above what Dr. Libby has referred to as the maximum permissible body burdens for peaceful uses for short periods of time. Therefore, you do have a chance to get the situation under control. I would say it was not one of the most serious problems one would have to face.

Dr. LIBBY. There is also another point, isn't there, Dr. Dunham, that you can purify water?

Dr. DUNHAM. That is right, with fairly standard methods.

Mr. HOLIFIELD. Now, we were talking about—during the course of your testimony—about the information transmitted to FCDA. Some of it is declassified, and some of it is classified. Now, in the case of that portion which is classified, is that in your opinion a hindrance to the top officials who receive that information? Is it a hindrance to them in that they can not pass that on to the local civilian defense officials?

Dr. LIBBY. It certainly is a hindrance, and their work would be easier if everything could be declassified. We try to declassify as much as we can as quickly as we can, but the Commission has to weigh these things one against the other.

And I think the situation is that by far the major portion—maybe I wouldn't know exactly what number; but say over 90 percent, can be put in the unclassified category so that they can use it freely.

Mr. HOLIFIELD. Certainly you have given enough testimony today on weapon effects to give facts to the civilian defense people which would enable them to at least start.

Dr. LIBBY. I would hope so; yes, sir.

Mr. HOLIFIELD. Would you recommend protective clothing as a standard item for civilian defense? That is, for civilian defense workers, let us say, monitors, and decontaminators?

Dr. LIBBY. I would offhand say it probably isn't necessary.

What do you think, Dr. Dunham?

Dr. DUNHAM. Well, it is like a lot of other things. If your situation is simple enough so you can do it, it would be nice to do, but you could do a very good job without a lot of fancy protective clothing.

Mr. HOLIFIELD. In other words, the changing of the clothes, the removing of the clothing that was exposed in itself, would be quite helpful; would it not?

Dr. DUNHAM. Oh, yes; taking the clothing off after it has been contaminated.

Mr. HOLIFIELD. And change into clothing which was not contaminated but which might be just ordinary type of clothing?

Dr. DUNHAM. Yes.

Dr. LIBBY. There is an aspect of the fallout that we didn't mention in the testimony this morning, and that is the burn hazard. That is, the fallout if it should fall on your skin. It will burn due to the beta radiation which is a short-range radiation. It will go a millimeter or so into your skin and give you a skin burn. This requires attention to bathing and washing it off.

Mr. HOLIFIELD. It is entirely possible that if the Japanese fishermen had known that this gray ash was radioactive and if they had hosed the decks and ship off with water and washed themselves that their hazard would have been brought down appreciably; would it not?

Dr. LIBBY. It certainly would have, sir, very, very appreciably.

Mr. HOLIFIELD. So any fallout as a result of ash of any kind that can be washed off, immediately, by the recipient, is very important?

Dr. LIBBY. Yes.

Mr. HOLIFIELD. We talked this morning about strontium 90 hazard within the local fallout area.

Could I ask you this: Does there still remain a strontium hazard on Rongelap?

Dr. LIBBY. We have recent data—let's say they were taken the last few months.

Dr. DUNHAM. The most recent reports indicate that the external dose on all of the islands of atoll of Rongelap is now less than the maximum permissible exposure as we use it in our atomic energy installations.

Mr. HOLIFIELD. So from that point of view, the islands are usable again?

Dr. DUNHAM. Right.

Mr. HOLIFIELD. How long has it been since they were first exposed?

Dr. DUNHAM. Just about 2 years and 5 weeks.

Mr. HOLIFIELD. And those islands were how far from point zero?

Dr. DUNHAM. They were, as I recall, about 110 miles.

Do you recall, doctor? I think it was 110 miles from the Rongelap Atoll.

Mr. HOLIFIELD. I think this fact that the strontium 90 hazard existed for a period of 2 years at 110 miles from point zero is an important fact.

Dr. DUNHAM. I think it is very important, Mr. Holifield, but I think it is important to keep this in perspective again. We are thinking in terms of a peacetime condition, and under a wartime condition we wouldn't be nearly as finicky about these things.

Mr. HOLIFIELD. Well, that is true. If it was necessary to go in for a short period, you would go in and take the hazard.

Dr. DUNHAM. Oh, yes.

Mr. HOLIFIELD. But from the standpoint of permanent occupancy, you would not.

Dr. DUNHAM. That is right.

Mr. HOLIFIELD. You would not have used it for permanent occupancy of civilians during this period of time?

Dr. DUNHAM. Well, again it would depend upon your calculated risk as to whether it is better to let them go back to a level that is 5 or 10 times the maximum permanent peacetime exposure or whether it is better to let them all stay somewhere else where they might die of disease and lack of shelter and so forth.

Mr. BALWAN. Are you going to permit the natives to go back to Rongelap?

Dr. DUNHAM. We are considering that right now.

Mr. BALWAN. They have not up to this point been permitted to go back?

Dr. DUNHAM. Not to Rongelap, no.

Mr. HOLIFIELD. Dr. Libby, there has been a great deal of talk in the papers about a cobalt bomb.

Could you comment within the bounds of security on the comparative radioactivity hazard from the use of cobalt, or would you care to comment on that?

Dr. LIBBY. I am afraid I really shouldn't, sir.

I made some general remarks this morning, though, about the effect of the bomb on the surroundings, and most surroundings, the radioactivity comes from the bomb itself.

Mr. HOLIFIELD. I see. There is nothing—let me phrase this question carefully: Is it necessary for civilian-defense officials on the declassified level to know the structure or the component elements in atomic or hydrogen weapons in order to do a good job of defending their people from hazard?

Dr. LIBBY. I dont' think it is necessary, sir. It might be helpful, but remember these weapons are highly technical devices operating on physical laws which are not generally known and which are very complicated, and I think that even if you published all of the details it would have a rather limited usefulness because of the technical complexity of it.

Mr. HOLIFIELD. Enough of the effect of these weapons and of the possible pattern of dangerous radioactivity in your opinion can be revealed, however, to take precautionary methods for survival?

Dr. LIBBY. I believe this is true, and I believe that information now available is adequate to make the proper plans.

This doesn't mean that we should not have a policy of adding to it as we obtain the information, but I do believe that what is now available is adequate to make proper plans.

Mr. HOLIFIELD. If at any time in the future you felt that the declassification of some of this type of information would contribute to the overall defense of the Nation, why, you would have no hesitation in making that known, would you?

Dr. LIBBY. If it were a vital matter, absolutely.

Mr. HOLIFIELD. I have forgotten, Dr. Libby, whether the point of explosion of the 1954 bomb was classified or not. That is, whether it was a power shot or ground shot or drop shot. Was that a matter of classification?

Dr. LIBBY. Well, we call it a surface shot, sir.

Mr. HOLIFIELD. I might just define what we mean by surface shot. We mean the fireball is touching.

If it is good contact so it is appreciably flat, we call it surface shot.

So if the fireball is 3 miles across and it is anywhere within 3 miles of the ground, it is a surface shot.

Dr. LIBBY. Yes.

Mr. HOLIFIELD. Our staff in studying this matter dug up a table which has been made public by the Washington Area Survival Plan Committee, quoting AEC as of August 25, 1955, based on a computation of 3,000 roentgen per hour at 1 mile, 1 hour after the burst of a 5-megaton weapon, assuming the March 1, 1954, bomb to be 3 times greater than this, would give an answer to the above question as about 10,000 roentgen per hour, 1 hour after the burst instead of 3,000, and the figure would correspond to a distance of 1 mile from ground to zero. Then, if that be true, the following extrapolation would be

reasonable as given out according to those who gave it out. Seven hours later, 1,000 roentgen hours, 2 days later, 100 roentgen hours, 2 weeks later, 10 roentgen hours, or 240 days; 1 month, 4 roentgen hours; or 100 roentgen per day; 3 months, 1 roentgen hour or 24 per day; 1 year, two-tenths or 5 roentgen hours per day.

Now, is that a reasonable extrapolation?

Dr. LIBBY. I checked most of the numbers as you read them off; yes, sir.

I must caution you about using this scaling wall beyond about a year. Isn't it, doctor?

After about a year this law which says that tenfold decrease in radioactivity occurs for over sevenfold increase in age, breaks down, and I have forgotten whether it goes——

Dr. DUNHAM. It goes more slowly because you have only left the longer lived products.

Dr. LIBBY. You have about 4 out of the 90 or 60, whatever the original number is, left at that time. Strontium 90, cesium 137, cerium 144, and ruthenium 106.

These are about it at 1 year. So from 1 year on, your table ought to be calculated on the basis of these 4.

Mr. HOLIFIELD. I see. In other words, at the end of 1 year, on a 15 megaton bomb, you would be getting 5 roentgens a day or you would get your 500 dose, accumulated doses, in 100 days at that time; would you not?

Dr. DUNHAM. If this worked out just that way.

Mr. HOLIFIELD. Yes.

Dr. LIBBY. But you see that an instantaneous dose, and during that hundred days you would be having some further decay; so your 5-hour per day applies to the end of the year. But by the time——

Mr. HOLIFIELD. It would be bigger at the beginning of the year. You would have to start out, in other words, larger.

Dr. LIBBY. That is right.

Mr. HOLIFIELD. But even if it were at that period, it would still be dangerous, wouldn't it?

Dr. LIBBY. This is a dose that is well above our normal doses; yes, sir.

Mr. HOLIFIELD. I think that has been made public, and that certainly they are figures that civilian defense can use in measuring patterns.

Now, you made a speech on January 19 which the committee has a copy of, in which you referred to Project Sunshine. Is this a classified project, or could you describe it?

Dr. LIBBY. Yes, sir. I could describe it.

Project Sunshine is devoted to the study of the strontium 90 distribution. I have presented to you many of the results of Project Sunshine this morning and the discussion.

Mr. HOLIFIELD. I was just trying to identify it. That is what it is.

Dr. LIBBY. That is what it is; yes, sir.

Mr. HOLIFIELD. Our staff was somewhat interested in figures which came from your speech of June 3 in which you used a 10-megaton bomb which would have fission products distributed over an area of a hundred thousand square miles. And your speech of February 15, which was—or the release of February 15 in which you used 7,000 square miles. Now, I know that that is not an unexplainable discrep-

ancy. But for the purposes of the record and such confusion as that might cause, would you explain that?

Dr. LIBBY. Well, one of the reasons I did that was to point out to people that there was nothing magic about the 7,000 square miles; just by pointing out some other area.

It was a fairly theoretical type of example. But I chose that to indicate that there might be a different area involved.

Mr. HOLIFIELD. In other words, you were comparing a theoretical assumption with the record of an actual happening?

Dr. LIBBY. Yes, sir.

Mr. HOLIFIELD. Well, that clears that up.

Was there any reason why the February 15, 1955, release mentioned the radioactivity only for the first 36-hour period?

Was there any reason why this should have been confined to the 36-hour period?

Dr. LIBBY. No.

Mr. HOLIFIELD. Do you feel that that type of a release would have a tendency to confuse the layman in that he might think that the 36 hours was the duration of that radioactivity?

Dr. LIBBY. I am afraid this was an inadvertent omission.

Mr. HOLIFIELD. I am sure it was. There is a reasonable explanation for it.

Dr. DUNHAM. I think the reason for the 36 hours was that this was 36 hours after the fallout which was about the time that the people on those islands were exposed, before evacuation.

I think that is how it got in there. I think also it indicated the rates of decay in the press release so that there should not have been a misunderstanding. I think that the radioactivity continued even beyond that.

Mr. HOLIFIELD. I don't believe that was indicated. That was one of the reasons that caused my question. But I can see where it was a measurement in point of time after the explosion.

Dr. LIBBY. Yes. I am afraid that was an inadvertent omission, sir.

Mr. HOLIFIELD. I asked the question so that the record can be clarified on that point.

Getting back to the subject of protection and what we can do to protect ourselves from radioactive hazard: Is it not true that there were some cheap metal structures on these islands which gave valuable protection to some of our people in comparison to those that were out in the open? I believe they were weather people. In other words, their rate of exposure was less than people out in the open?

Dr. DUNHAM. Very definitely anybody who was inside one of those structures on Rongelap——

Mr. HOLIFIELD. And they were just cheap metal structures; were they not.

Dr. DUNHAM. I think one was a tent which would have given some protection. I think another one was a corrugated metal structure of some sort.

Mr. HOLIFIELD. I think this point is important for civilian populations to know, that in this actual case of exposure there was an unplanned, you might say, protection which occurred as a result of a very cheap metal building.

Mr. HOLIFIELD. Now, if this be true, does this not lend weight to the advocacy of some type of radiation shelters?

Dr. LIBBY. Well I think the ordinary house is not too bad, especially if it has a cellar and has some stories, you know.

Mr. HOLIFIELD. I noticed in the civil-defense tests out in—that is, the tests of weapons out in Nevada—I noticed that some lean-to shelters were in basements, special lean-to shelters; and they gave a tremendous amount of protection in some of those houses that were completely destroyed above ground to dummies and other articles that were placed in there.

Dr. LIBBY. This was against blast and thermal?

Mr. HOLIFIELD. Yes.

So, there are some things that can be done.

Dr. LIBBY. Absolutely.

And my saying that evacuation is probably necessary for the central area, that does not mean that you should not build shelters and think about using them and learn about the opportunities in your own home that you have in your office and naturally available shelters. You should learn about those.

Mr. HOLIFIELD. As a matter of fact, taking into consideration the fact that you will not know where point zero may be, the best overall bet is some type of shelter below ground if possible?

Dr. LIBBY. Yes, sir.

Mr. LIPSCOMB. When we talk about evacuation, are we talking about prior to the blast or after the blast?

Dr. LIBBY. Prior.

That is, for blast and thermal. On fallout, whatever evacuation will be will be well after. I guess that is true. I suppose it is conceivable that you might hear over the radio that there was going to be fallout. Do you suppose that is possible?

Dr. DUNHAM. It is theoretically possible. The question again is: how feasible is it?

Dr. LIBBY. Yes.

But I think for fallout, your evacuation is mainly well after you sit and wait out probably the hottest portion; or else you may be close enough to the edge so you can get out.

Mr. LIPSCOMB. When you speak of evacuation, you are primarily thinking of prior to the blast?

Dr. LIBBY. Against blast and thermal; yes, sir.

Mr. LIPSCOMB. And then the time element is really important?

Dr. LIBBY. Yes, sir.

Mr. LIPSCOMB. And we have your testimony on the time element. We will have to discuss that with someone else?

Dr. LIBBY. I think you should.

Mr. HOLIFIELD. I believe that will be DOD, because they have the responsibility of the early warning time.

Dr. LIBBY. That is right.

Mr. HOLIFIELD. In the forthcoming Pacific bomb tests, will the FCDA have people there, and will in your opinion these tests develop information valuable for civil defense?

Dr. LIBBY. The answer is "Yes" to both questions.

Mr. HOLIFIELD. I don't believe there were civilian-defense people present in the 1954 Castle series, were there?

Dr. DUNHAM. There was at least one observer. There were three people present.

Mr. HOLIFIELD. Were any of those people nuclear physicists?

Dr. DUNHAM. No; not real nuclear physicists.

Mr. HOLIFIELD. Then they would have been of no value in preparing the test reports on damage, particularly?

Or maybe I should ask if they participated in preparing the test reports?

Dr. DUNHAM. No. They were there as observers.

Mr. HOLIFIELD. I understand there are three positions open on the Federal Civil Defense Agency for scientists. Do you know whether any of those have been filled?

Dr. DUNHAM. I do not know, sir.

Dr. LIBBY. We have some positions open.

Mr. HOLIFIELD. I am sorry. I can't qualify.

Mr. LIPSCOMB. Mr. Chairman, along that line: What are the grades that are open?

Dr. LIBBY. I don't know offhand.

Do you know, Dr. Dunham?

Dr. DUNHAM. I don't know. You would have to ask Civil Defense.

Mr. LIPSCOMB. What is the average salary then of a scientist within these agencies?

Mr. HOLIFIELD. I am afraid I can't answer that question.

The question, Dr. Libby, was: What is the average salary of scientists within the Atomic Energy Commission, and are they under the regular grade system of civil service, or are they exempted from it?

Dr. LIBBY. Well, Mr. Chairman, we operate on the contract system. Most of our operations are conducted under contract by outside organizations. And so the salary structure depends to a certain extent on the contractor's salary.

We also have, of course, several thousand employees of the AEC itself. And there are a certain number of scientists in that category.

Now, I do not have, but will be glad to furnish for the record, the exact numbers that you ask for. And I will see that those are sent in.

Mr. HOLIFIELD. Do you know offhand if they are subject to the civil-service grades?

Dr. LIBBY. The contractor's employees are not.

Mr. HOLIFIELD. I know they are not. But I am speaking of the scientists that are hired directly by the Commission.

Dr. DUNHAM. I think they generally do follow the civil service pretty closely.

Mr. BALWAN. We have as an observer a member of the planning commission from FCDA and he probably could answer the question as to scientists.

Mr. HOLIFIELD. Would you identify yourself, please.

STATEMENT OF DEAN POHLENZ, DEPUTY ASSISTANT ADMINISTRATOR FOR PLANNING, FEDERAL CIVIL DEFENSE ADMINISTRATION

Mr. POHLENZ. My name is Dean Pohlenz. I am Deputy Assistant Administrator for Planning, FCDA.

All the positions in FCDA are classified positions and they are civil service. There are no exceptions.

Mr. BALWAN. That includes the ones referred to? Are we correct in the assumptions made about the three positions for scientist?

Mr. POHLENZ. I can't give you a total figure for scientists in the agency. There is one vacancy for a physicist on the research staff and planning staff.

Mr. BALWAN. There is a position, and it is vacant?

Mr. POHLENZ. That is right.

Mr. BALWAN. You have no idea what the salary range might be in following up Mr. Lipscomb's questions?

Mr. POHLENZ. It is a grade 15, which is about eleven-thousand-and-some dollars.

Mr. HOLIFIELD. As long as you have identified yourself for the record, can you tells us if you have any nuclear physicists on your staff at FCDA?

Mr. POHLENZ. No, sir.

In answer to this gentleman's question, there is a staff position for one nuclear physicist and it is vacant now.

Mr. HOLIFIELD. I see.

Mr. LIPSCOMB. Dr. Libby mentioned that there was a lot of stiff competition for scientists. Is that because of the salaries that are paid between private industry and Government, or is it just because of the shortage?

FURTHER STATEMENT OF DR. WILLARD F. LIBBY, COMMISSIONER, UNITED STATES ATOMIC ENERGY COMMISSION; ACCOMPANIED BY R. L. CORSBIE, DIVISION OF BIOLOGY AND MEDICINE; AND DR. CHARLES L. DUNHAM, DIRECTOR, DIVISION OF BIOLOGY AND MEDICINE

Dr. LIBBY. It is because of the shortage. There just aren't enough engineers and scientists and technical people for the needs, the demands, the jobs. There just are not enough. And our problem, of course, is to educate more and to interest more people in such careers.

It is a national problem of the greatest importance. And we see it coming to light again in this inquiry. But every place you look you will see this problem.

Mr. LIPSCOMB. So, it is not the inadequacy of the salaries that the Government is able to pay?

Dr. LIBBY. Well, I wouldn't say that higher salaries would not help Government compete with industry. It certainly would. But industry is short even with their high salaries. So, it is not entirely a question of salaries. I think the fundamental point is that there just are not enough technical people. And what you do is you just raise the salaries, and you steal them from someone else. A good bit of that goes on. But it creates a shortage some place else. We need more.

Mr. HOLIFIELD. These are one or two things I would like to clear up before we conclude and give the other members some opportunity to question if they desire.

In your speech of January 19, the statement is made that it would take a total of 11,000 megatons of nuclear explosions to yield a global fallout of radiostrontium equal to the maximum permissible amount. Now, I assume that his computation was made on the basis of the Castle series test type of weapon and under the same weather and conditions?

Dr. LIBBY. We made this calculation on the basis of worldwide dissemination via the stratosphere; and it was for 11,000 megatons of fission energy. And we simply divided it up uniformly. And I outlined it this morning a little bit in my testimony.

Mr. HOLIFIELD. Now, there is one point that there might be some confusion on.

In your use of the 10-megaton bomb and your assumption of a hundred thousand square miles, would you care to say whether you were talking about the same type of a bomb under different conditions, or were you talking about a different type of a bomb?

Dr. LIBBY. I was talking about—I believe the figure was 10 megatons of fission energy. That is 10 megatons of fission energy was released. I am afraid I cannot go any farther.

Mr. HOLIFIELD. That was merely an assumption that, if that amount was released, that it could cover a hundred thousand miles. But it did not necessarily mean that it would cover it with the intensity that the 7,000 miles were covered in the test?

Dr. LIBBY. That is right.

As you might imagine, conditions where the stuff would go up and come essentially straight down, I suppose, if no winds were blowing, that sort of thing might happen. There would be a sort of dispersal. I don't know what the area might be. If there were absolutely no winds and it went up and a large chunk came directly down, it might be 10 miles by 10 miles, or maybe larger; something on that order.

Mr. HOLIFIELD. On the other hand, if there was a strong wind blowing, there would be a wider dispersal and a lesser intense radiation per square foot or yard?

Dr. LIBBY. That is right.

Mr. HOLIFIELD. Are there any questions that any of the members would like to pursue at this time?

Mr. RIEHLMAN. I think it might be well to have on the record the doctor's attitude toward a recent statement made by General Sarnoff in respect to the tremendous lack of scientists we have in this country.

Did you read his recent statement about setting up an educational program by allocating scientists from industry to give at least a year of their time for the teaching profession?

Dr. LIBBY. I did, sir. And I read it with real pleasure. It seems to me that we have a national emergency. And we have to do something about curing it quickly. And one of the problems is the shortage of teachers. You cannot train teachers overnight. And we do need teachers, particularly in the high schools, to teach mathematics and physics and chemistry and technical subjects so that, when the students go to college, they won't find themselves barred from engineering and scientific studies because of their inadequate or, shall I say, incorrect preparation from this point of view in the high schools. And these people that General Sarnoff referred to can certainly help.

Now, of course, there is a problem of whether they can teach. They know the subject. And that is an old and difficult problem. But it is certainly true that they might help. And I hope something can be worked out so that we can get scientists and engineers who are now educated and of course awfully busy with what they are doing to spend some time helping in this emergency.

Mr. RIEHLMAN. I knew it was a rather broad approach, and I think the general felt that way when he made the presentation. But I think

it is good food for thought and something in the way of a constructive suggestion to alleviate the problem we have in the teaching profession in this particular field, which is so essential to training of scientists for future benefit to our country.

Dr. LIBBY. It certainly was a most valuable suggestion. And I hope it will bear fruit.

Mr. HOLIFIELD. Mr. Kilgore.

Mr. KILGORE. I have no questions.

Mrs. GRIFFITHS. I just want to say that I have enjoyed the presentation here by Dr. Libby.

Mr. RIEHLMAN. I would like to join in that statement.

Mr. ROBACK. I would like to ask this question, Doctor: What order of urgency do you assign to civil defense? Let's assume we are spending at the rate of a hundred million dollars a year for this effort. What budgetary assignment would you make if you were using your judgment?

Dr. LIBBY. It seems to me it is of the greatest importance, and I would have difficulty putting it in dollars, but it certainly is an extremely important effort. We wish to do everything we can as quickly as we can to protect ourselves, and I would hesitate to put it in terms of dollars, Mr. Roback, but I hope my answer is responsive to the question that we should do everything we can.

If dollars can help, we ought to appropriate them.

Mr. ROBACK. Now, do you believe that the Atomic Energy Commission has been belated in making civil-defense information public?

Dr. LIBBY. As I said this morning, we have tried to do a good job, but I don't think we have done a completely perfect job, and I think our performance in the future may be better than it has been in the past, but we feel that we have done a fairly creditable job at making it available.

As I said a few minutes ago, I think we have got enough information out so that the civilian defense can move on an unclassified basis to do a good job of planning to defend the country against an atomic attack.

More could be used, and we should try to get it to them, and one of the problems is learning it. We have to learn these things. The Project Sunshine has taught us quite a lot about fallout that we didn't know and we are learning all the time.

We are learning all the time, and we try to get it over to them as quickly as we get it.

Mr. ROBACK. Is your information as presented here based in part upon findings in that project?

Dr. LIBBY. Yes, sir.

Mr. ROBACK. Is that project completed?

Dr. LIBBY. It is continuing and will continue indefinitely as far as we know.

Mr. ROBACK. Now, with regard to information of that sort, have you, in the course of speeches since you have come into the AEC, have you made public new information, substantially new information, not known to the public before?

Dr. LIBBY. Yes. In nearly every instance there has been something that has not been known to the general public. I would say there have

been—most of the releases have been in the way of reiteration and teaching; that is, repetition is very important in teaching.

You have to say the same thing over and over again in order to teach it, but every release has had something in it that has not been emphasized, perhaps, as widely and as clearly as it should. It may have been declassified and might have been published, but it perhaps has not been emphasized as widely as it should.

Mr. ROBACK. Has all such information there before your making the statement been available to the Federal Civil Defense Administration?

Dr. LIBBY. Yes, sir; they have had the information in general on a classified basis about as soon as we have gotten it. The problem of declassifying it is a problem which we have to work on, and we have worked on it.

The release of it to the public is not just a question of declassification. You have to find a medium, and I think this hearing is going to be a very beneficial thing by once again saying over and over some of the important things, and emphasizing them in new lights and bringing them to mind again and getting people to notice them and think about them and continue to think about them.

This is the kind of thing we need to do, so our releases are a culmination of reiteration and emphasis of new information.

Mr. ROBACK. You made a statement in your presentation which apparently leaves the impression that the effect of the genetic—the genetic effects of strontium, or perhaps other radioactivity, are so far as is known, negligible.

Dr. LIBBY. That is only with regard to strontium.

Mr. ROBACK. As far as other radioactivity effects are concerned, they may or may not be serious.

Dr. LIBBY. If you will allow me, Mr. Chairman, I would like Dr. Dunham to discuss the genetic problem for a minute or two.

Would you mind doing that, Doctor?

Mr. HOLIFIELD. We would like to have that information, sir, if you would care to make it.

Dr. DUNHAM. I am not a geneticist, myself.

Mr. HOLIFIELD. I heard a geneticist speak on this subject one day and when he got through I couldn't understand what he had said. So maybe you will be able to give me some information that we wouldn't understand from a geneticist.

Dr. DUNHAM. You are talking in terms of the long-term effects of a fallout. Was that the basis of your question?

Mr. ROBACK. That is right.

Now, in some quarters that is regarded as a very terribly serious problem. In others, the impression has been left by statements made by the Atomic Energy Commission, or perhaps individual Commissioners, that the problem has been exaggerated.

Dr. DUNHAM. I think both statements are correct. Some people have exaggerated the problem. Others have, perhaps, minimized the problem.

I think the basic problem we are faced with is the lack of actually precise information as to what the genetic effects on human beings are from a given amount of radiation, particularly when we are talking about very low-level exposures over a long period of time.

Mr. ROBACK. So that it is an open question, given the present state of the knowledge, as to whether continued testing may have an adverse genetic effect?

Dr. LIBBY. Oh, no, sir. I can contribute a little bit to that. You see, we do have some experience in that we do have radioactivity in our environment normally, in our bodies, and from the cosmic rays and from the ground, and the test exposure is very small as compared to this radiation everyone receives normally.

Now, this does not answer the question that Dr. Dunham is raising, as to how much radiation it takes to constitute a genetic hazard, but it does point out that we do have normally a very considerable amount of radiation in our everyday lives.

The test exposure is small compared to that, and I think perhaps that was helpful in orienting us on the effects of test exposure on genetics.

Mr. HOLIFIELD. Isn't it true, also, that the Atomic Energy Commission has been making experimental tests on mice and other small animals for several years on this particular subject and that their conclusions from that standpoint have that type of progressive generations of animals to back them up in some of their conclusions?

Dr. LIBBY. Yes, sir. Of course, there remains the question of comparison of a man with a mouse, but we spend a great deal of time and money on our mouse colony in Oak Ridge.

I think it is probably the leading genetic center in the world at the moment from an experimental point of view. I believe that is true. Wouldn't you say, Dr. Dunham?

Dr. DUNHAM. That is true, and certainly the size of the project is greater than any anywhere else in the world.

Mr. HOLIFIELD. And you must be in a high multiple of generations, now, of mice, the experimental animals, are you not?

Dr. DUNHAM. Not very many. The mouse, it is a matter of a year or two before you follow through from one generation to another. That project at Oak Ridge started about 1949. This was all getting our information more precise. I wasn't trying to indicate that we didn't know anything about it, but when it comes to these little fine points—and this is where there get to be differences of opinion and why occasionally there is confusion about it.

Mr. HOLIFIELD. We have also a continuing study on the Japanese victims of Hiroshima and Nagasaki.

Dr. DUNHAM. The study on the first generation has been terminated, because of what you might call the law of diminishing returns. The women are getting past the childbearing age, many of them.

Also, birth control has taken over so that both in the control population and in the radiated population, the birth rate is much lower than it was to begin with.

Mr. HOLIFIELD. I see.

Mr. DUNHAM. We are keeping tab of all the offspring of these people, so that eventually we will probably set up a second generation study.

Mr. ROBACK. Dr. Libby, will you comment on this statement that was in the February publication, the statement by Chairman Strauss in a publication of the AEC?

I quote:

An in-the-air explosion where the fireball does not touch the earth's surface does not produce any serious radiological fallout hazard.

Now, is your statement consistent with that statement, or does it require qualification?

Dr. LIBBY. Yes; it is. In this way, Mr. Roback: When we talk about civilian defense, we are talking about the local type of fallout which may cover several thousand square miles or may cover a hundred thousand square miles.

If you call that our hazard, and fallout, then this statement is right.

Mr. ROBACK. Then this statement read by a layman who doesn't know much about it might be confusing.

Dr. LIBBY. That is a difficult point. The way it goes is this: If you have the large weapons where the fireball and the cloud rise into the stratosphere, then the dissemination is very wide, indeed, and there is a small fraction of the material which falls out within the same general latitude.

There may be even a very tiny fraction which falls out within the vicinity of a few thousand square miles, but the thing that causes the heavy local fallout is the contact of the fireball with the ground, or the surface of the earth, I should say.

Mr. ROBACK. I only have 1 or 2 more questions, Mr. Chairman.

I wanted to ask you to comment on a statement made by a fellow Commissioner, not with respect to making any points of difference, but as to whether you agree with the point made as a matter of fact, or as a matter of judgment.

Now, this is the statement by Commissioner Thomas Murray made in a speech delivered before the Golden Jubilee Dinner at Fordham Law School on November 17, 1955. In this speech, he says—he makes this judgment:

> But the slow process of educating the people in the new habits of thought proper to the age of the nuclear revolution has not been equally furthered by public policies.

Do you agree with that statement?

Dr. LIBBY. Well, Mr. Murray has emphasized a point there which I have mentioned in my testimony today. I think we never do a perfect job of education, and we always could say that we could have done a better one.

I think we have done a pretty fair job, but we will try to do better in the future, and I think that we have reason to believe that we have done a fair job of it. We are all self-critical about this matter, and hope that we can do a perfect job and keep at it and keep improving all along.

In that sense, I agree with his statement. But in the sense that it implies that our job has been catastrophically poor, if any such implication was involved, I do not agree. I think that we have put out information in sufficient quantities so that the civilian defense can attack their problem.

It isn't that we have done a perfect job, but we have done a creditable job.

Mr. HOLIFIELD. Without assessing any blame at all, I think the majority of the members of this committee, one of the things that caused us to think of this study was the fact that we felt that inadequate public information had been spread among the people.

Maybe it has been made known in different instances, but it had not been made known to the ordinary layman.

Dr. LIBBY. That is right.

Mr. HOLIFIELD. And this is one of the good things that we hope will come out of these committee hearings, will be that the hearings and the subsequent report will receive distribution and help along in the understanding of this tremendous problem.

Mr. ROBACK. Now, Mr. Murray continued, and I will read just briefly, Mr. Chairman:

> Twenty-seven Japanese fishermen announced to the world the first fateful news about the lurking catastrophe that may possibly lie in wait for all of us.
>
> In this instance, the official policy of secrecy proved inept when the secret came out through the wrong channels. It shocked the world.

Now, the question that I have is, When could the AEC, had it so willed, have made known information about fallout?

Dr. LIBBY. You catch me a little cold, Mr. Roback. I wasn't a member of the Commission at that time, and my impression is that the Commission made it known—the general overall, not the details as given in the February 15 release—but the general overall existence of this hazard was made known about 4 weeks after it occurred.

Isn't that so, Dr. Dunham?

Dr. DUNHAM. I don't recall the exact dates, Dr. Libby. I would have to check that.

Dr. LIBBY. I think the chairman made a statement on the 31st of March, which was——

Mr. ROBACK. Can we draw the inference from that sequence of events that had this Japanese incident not occurred, that the information may not have yet been known?

Dr. LIBBY. Oh, no.

Mr. ROBACK. What is the ground for the statement, Dr. Libby? Do you feel that AEC was preparing to make its information known?

Dr. LIBBY. Well, as I say, I wasn't a member of the Commission at that time, and I am not aware of what went on in the inner circles, but I can assure you that my position and the majority of the Commission now, all of the Commission now, would have taken the stand of relating it on the grounds of protecting the population against the hazard, and so this very unfortunate accident was not the prime mover in the release of this information.

I don't believe, though I wasn't a member of the Commission, and I cannot speak positively, but I will say had it happened now, it would not be.

Mr. ROBACK. Certainly your own entry to the Commission, you say, was just as important.

Mr. HOLIFIELD. The committee feels deeply indebted for the better than 4 hours that you have given us of your time today. We know how busy you are, and we will all study your testimony.

It might be possible that we might have to ask you at some future time during these hearings to help us out a little bit, and if we do, may we feel free to call on you?

Dr. LIBBY. Yes, sir; absolutely.

Mr. HOLIFIELD. I want, on behalf of my colleagues, to extend their thanks and my personal thanks for your appearance here today and your frank answers to the questions that have been asked you.

Dr. LIBBY. Thank you, Mr. Holifield. It was a pleasure to be here, and I think that you are going to sell many tens of thousands, or circulate many tens of thousands of copies of this hearing.

Mr. HOLIFIELD. Maybe we can make some money for the Government Printing Office.

Thank you very much.

The meeting is adjourned.

(Whereupon, at 4:20 p. m., the subcommittee adjourned, to reconvene at 10 a. m., Wednesday, February 1, 1956.)

Mr. HOLIFIELD. I received a letter this morning under date of February 3 from Mr. Ralph W. Weymouth, Route 2, Woodenville, Wash.

MY DEAR CONGRESSMAN: I am very much interested in an AP dispatch dated January 31 to the effect that your committee is holding hearings with the purpose of informing the public fully on the possibilities of civil defense.

May I request that you send to me all of the printed reports of the hearings before your committee as they are issued, which it is permissible for the public to receive.

I am building an underground shelter on my property, which is approximately 18 miles from probable target, Seattle, at an expense of several thousand dollars, which includes standby electric plant, an air filtration system, plumbing, lighting, water supply, sewage disposal, etc.

In none of the publications of the Civil Defense Administration have I noticed proper warning of the necessity of adequate air supply and its filtration.

What is the use of getting underground if you have to breathe air containing fallout which will kill you?

Your hearings might bring out some point which I have overlooked in the design of my shelter, but which would save the lives of my family.

(Signed) RALPH W. WEYMOUTH.

This was handed to me by the staff as I came to the meeting and I thought this was appropriate to show the interest that one individual at least has in this program.

Proceed.

Mr. BASCOM. In West Germany, however, after April 1 this year all new houses in cities over 10,000 are required by law to have shelters.

Mr. HOLIFIELD. I think we might emphasize that last sentence in that paragraph by rereading it, Mr. Bascom.

Mr. BASCOM. In West Germany, however, after April 1 this year all new houses in cities over 10,000 are required by law to have shelters.

The effects of large nuclear weapons are such that shelter requirements fall into three general categories:

(1) In the crater area no shelter can be made strong enough;

(2) In a narrow ring outside the crater area a very sturdy shelter will offer protection;

(3) In a very large area a moderate strength shelter capable of withstanding up to one atmosphere of pressure (15 pounds per square inch) will give excellent protection.

During the recent Nevada tests, windows were splintered and the glass flung about in a lethal manner by 0.6 pounds per square inch (well outside the usual FCDA damage rings). The ratio of these areas in which shelter is needed is about 1:60:4,000.

Mr. BALWAN. Can you explain that?

Mr. BASCOM. We have a crater area directly underneath an explosion where no shelter can stand up. Then there is an area roughly 60 times that large in which a very good shelter would stand up. Then there is an area nearly 4,000 times that large in which a moderate strength shelter would be effective.

Mr. HOLIFIELD. That is all still in the pattern of bomb effect, the 4,000 area is assuming——

Mr. BASCOM. These figures refer to areas in which persons are likely to need some kind of a shelter regardless of the size of the bomb. They are ratios, not square miles.

Mrs. GRIFFITHS. Mr. Chairman, what is the size of the center of destruction with the largest bomb that could be dropped now? Would it be 4 miles?

CIVIL DEFENSE FOR NATIONAL SURVIVAL

(PART 3—Dr. Lester Machta, C. D. Curtiss, Otto L. Nelson, Jr., Dr. Lauriston S. Taylor, Dr. Harold K. Skramstad, Dr. Ralph Lapp, Dean Snyder, Dr. Leonard Scheele, William L. Mitchell, Shelby T. Grey, Dr. John R. Luddington, Dr. Charles L. Dunham, Dr. Eugene P. Cronkite, Dr. G. Burroughs Mider, Edward Cohen, H. L. Bowman, J. Edmund Fitzgerald, Martin D. Kirkpatrick, and John P. Chapman)

HEARINGS

BEFORE A

SUBCOMMITTEE OF THE COMMITTEE ON GOVERNMENT OPERATIONS HOUSE OF REPRESENTATIVES

EIGHTY-FOURTH CONGRESS

SECOND SESSION

MARCH 13, 14, 15, 20, 22, 23, 27, 28, AND 29, 1956

Printed for the use of the
Committee on Government Operations

UNITED STATES
GOVERNMENT PRINTING OFFICE
72796 WASHINGTON : 1956

COMMITTEE ON GOVERNMENT OPERATIONS

WILLIAM L. DAWSON, Illinois, *Chairman*

CHET HOLIFIELD, California
JOHN W. McCORMACK, Massachusetts
EARL CHUDOFF, Pennsylvania
JACK BROOKS, Texas
LESTER HOLTZMAN, New York
ROBERT H. MOLLOHAN, West Virginia
L. H. FOUNTAIN, North Carolina
PORTER HARDY, JR., Virginia
JOHN A. BLATNIK, Minnesota
ROBERT E. JONES, Alabama
EDWARD A. GARMATZ, Maryland
JOHN E. MOSS, California
JOE M. KILGORE, Texas
DANTE B. FASCELL, Florida
MARTHA W. GRIFFITHS, Michigan
HENRY S. REUSS, Wisconsin

CLARE E. HOFFMAN, Michigan
R. WALTER RIEHLMAN, New York
CECIL M. HARDEN, Indiana
CHARLES B. BROWNSON, Indiana
GEORGE MEADER, Michigan
CLARENCE J. BROWN, Ohio
GLENARD P. LIPSCOMB, California
B. CARROLL REECE, Tennessee
J. ARTHUR YOUNGER, California
VICTOR KNOX, Michigan
OTTO KRUEGER, North Dakota
CHARLES R. JONAS, North Carolina
WILLIAM E. MINSHALL, Ohio

CHRISTINE RAY DAVIS, *Staff Director*
ORVILLE S. POLAND, *General Counsel*
WILLIAM PINCUS, *Associate General Counsel*
HELEN M. BOYER, *Minority Professional Staff*

MILITARY OPERATIONS SUBCOMMITTEE

CHET HOLIFIELD, California, *Chairman*

EDWARD A. GARMATZ, Maryland
JOE M. KILGORE, Texas
DANTE B. FASCELL, Florida
MARTHA W. GRIFFITHS, Michigan

CLARE E. HOFFMAN, Michigan
R. WALTER RIEHLMAN, New York
GLENARD P. LIPSCOMB, California

MEMBERS EX OFFICIO

WILLIAM L. DAWSON, Illinois
CLARE E. HOFFMAN, Michigan

MICHAEL P. BALWAN, *Staff Director*
HERBERT ROBACK, *Director of Investigations*
JAMES F. ECKHART, *Assistant Counsel*
EARL J. MORGAN, *Investigator*
ROBERT J. McELROY, *Investigator*
CAREY BREWER, *Legislative Reference Service, Library of Congress*

CONTENTS

CIVIL DEFENSE FOR NATIONAL SURVIVAL

TUESDAY, MARCH 13, 1956

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON MILITARY OPFRATIONS OF THE
COMMITTEE ON GOVERNMENT OPERATIONS,
Washington, D. C.

The subcommittee met at 10:10 a. m., in Room 1501 New House Office Building, Hon. Chet Holifield (chairman of the subcommittee) residing.

Present: Representatives Holifield (chairman), Mrs. Griffiths, Riehlman, and Lipscomb.

Also present: Michael P. Balwan, staff director; Herbert Roback, director of investigations; Earl J. Morgan, investigator; and Carey Brewer, Legislative Reference Service, Library of Congress.

Mr. HOLIFIELD. The subcommittee will be in order.

We have before us this morning the United States Weather Bureau representatives and the representatives of the Bureau of Public Roads.

We will call for the first witness, Dr. Machta, Chief of the Special Projects Section and Mr. J. J. Davis, Civil Defense Coordinator of the United States Weather Bureau.

Dr. Machta, we are glad to have you with us this morning.

I see you have a prepared statement, Dr. Machta, would you like to give that first and then have a series of questions?

You may proceed.

STATEMENTS OF DR. LESTER MACHTA, CHIEF, SPECIAL PROJECTS SECTION, AND J. J. DAVIS, CIVIL DEFENSE COORDINATOR, UNITED STATES WEATHER BUREAU

Dr. MACHTA. Weather plays a vital role in distributing radioactive fallout from atomic explosions. When a nuclear bomb is detonated at or near the earth's surface, the minute radioactive bomb fragments attach themselves to soil particles.

The larger of these soil particles and their radioactive coating fall to earth within a short time—from a few minutes to many hours.

As the particles descend, the winds transport them horizontally in exactly the same way that any object is carried by the wind. Where an individual particle lands depends on where it starts, how fast it falls and on the different wind speeds and direction it encounters on its way down to the ground. Experience with our weapons-testing program is sufficient to convince us that two identical bomb detonations under different wind structures will result in entirely different fallout patterns.

There are three questions which a civil-defense director may ask of the weatherman: (1) Where will the fallout occur; (2) how intense will it be; and (3) when will it begin?

The meteorologist can readily advise of likely areas of fallout and arrival times for the beginning of the fallout. All the weathermen must know to give this information is the ground zero, the winds, and the nuclear cloud dimensions.

Maximum values of the cloud sizes can be used in the preattack estimates. With little difficulty, then, the meteorologist can provide areas of potential fallout hazard and the amount of time between bomb explosion and first arrival of the dangerous particles.

To answer the question: "What is the radioactive dosage?" requires all of the information needed to answer the other questions plus certain vital bomb data. One must know the yield, the height of burst, and the nature of soil over which the explosion occurs. Further, it is necessary to infer the kind of particles which will be formed from city rubble from that which we have found from desert sand and island coral.

The prediction of radiation intensities or dosages is much more than a meteorological problem. It is even doubtful whether certain kinds of bomb information such as appropriate yields would ever be obtained in time to be of any use.

Mr. BALWAN. Why do you say that?

Dr. MACHTA. Simply because of the fact that it is necessary to have a complete network of detecting stations to obtain the location of the bomb explosion in order to know the ground zero, and to determine its yield.

Mr. BALWAN. You say, "whether certain kinds of bomb information such as appropriate yields." Are there any other kinds?

Dr. MACHTA. You mean other kinds of yields?

Mr. BALWAN. Other kinds of information?

Dr. MACHTA. Yes. What we need is the yield of the bomb—how many megatons of fissionable products are created—and the height of burst. If the fireball does not intersect the ground, very little fallout results. We must know whether the terrain and installations over which the burst occurs will produce very fine particles or large particles.

The most pressing need of a civil defense director is a preattack estimate of where fallout will occur. The Weather Bureau is fulfilling this need by twice-daily fallout forecasts. Beginning on June 1, 1955, the Weather Bureau undertook to transmit such predictions on weather teletypewriter circuits.

This initial crash program employed only 34 of the upper wind observing stations nearest the major targets in the United States.

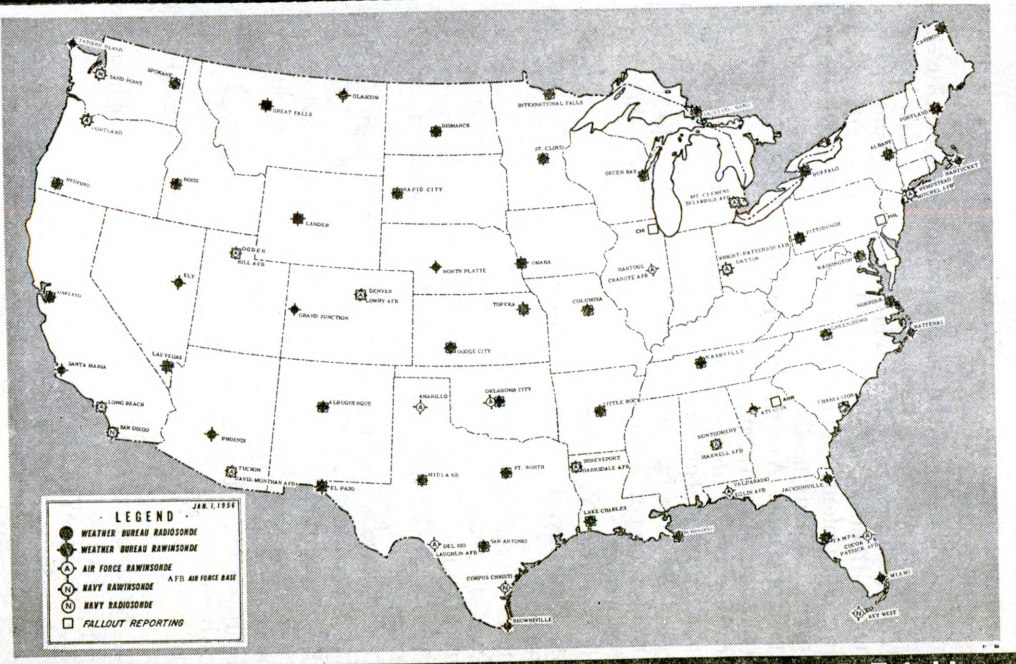
On February 1, 1956, this network was expanded to 52 stations. We can show you the distribution over the United States. (See chart No. 1.) The squares indicate the upper air observation stations which are participating in this program. They are distributed and selected to be closest to the major targets in the United States but cover, I believe, regions close to every populated area.

(Chart No. 1 referred to follows:)

CHART NO. 1—UNITED STATES UPPER AIR AND FALLOUT FORECASTING NETWORK

RADIOSONDE AND RAWINSONDE

REPORTING NETWORK IN THE UNITED STATES



· UNITED STATES WEATHER BUREAU ·

Mr. BALWAN. Might be desirable to have this chart so that it may be included in the record, this information, for anybody who needs it?

Mr. HOLIFIELD. Are you prepared to leave the charts?

Dr. MACHTA. We will provide you with the information.

Mr. HOLIFIELD. Of any of the charts we need?

Dr. MACHTA. Yes.

Mr. HOLIFIELD. We would like to have this one. You have several different designations. Would you mind explaining them before we leave that chart?

Dr. MACHTA. Yes; the upper winds observation is obtained by several types of equipment, some of which are better than others. Each of these types indicate whether we use visual methods for tracking the balloon as it rises, whether we use radar or radiodirection finding equipment. The designation denotes which of this type of equipment is being used.

Mr. HOLIFIELD. Are these locations selected because of being contiguous to primary targets?

Dr. MACHTA. The stations in the fallout network were so selected. The choice of stations at which upper wind observations are taken are selected on the basis of their meteorological desirability.

Mr. HOLIFIELD. They were already selected then previous to this type of work.

Dr. MACHTA. Yes, sir.

Mr. BALWAN. Is Canada cooperating with you in this program in any way?

Dr. MACHTA. Yes, sir; they are.

Mr. HOLIFIELD. They have a similar service, do they?

Dr. MACHTA. They are about to undertake such a service at our suggestion on the basis of the fact that it seems to be quite a desirable program.

Mr. HOLIFIELD. But they do not have any in being at this time?

Mr. DAVIS. Not at this time, sir. They envision eight stations. They have agreed to go into the United States network and they are presently working up the instructions to send to those eight stations. We may see it in the next 30 days perhaps.

Mr. BALWAN. Does fallout affect Canadian cities?

Are bomb bursts on American cities of danger to them?

Dr. MACHTA. Yes. A detonation on Detroit might affect a large part of populated Canada.

Mr. HOLIFIELD. There are prevailing winds which sweep to the north or northeast.

Dr. MACHTA. Yes, sir.

These fallout messages employing a simple code are transmitted twice each day to over 500 teletype outlets throughout the country. Each of the Weather Bureau field officials has contacted the local or State civil-defense organizations to offer the fallout reports if they want them. There has been no increase in the number of operational personnel to furnish the fallout data required by the Federal Civil Defense Administration.

In an effort to lend meteorological support to FCDA, and to bring better public understanding of fallout forecasts, the Weather Bureau has assigned nine fulltime experienced meteorologists to the FCDA national and regional offices.

These specialists serve as staff meterologists to FCDA officials, and advise them on all fallout problems, and natural disasters, such as

floods, tornadoes, hurricanes, drought, and the like. They travel in FCDA regions, perform liaison with State and local civil defense agencies, and assist in training local employees to decode, plot, and use fallout forecasts.

The cost of the Weather Bureau's civil defense activities has been substantially met by money transferred from the Federal Civil Defense Administration. Salaries and travel expenses of nine professional meteorologists in FCDA offices and two meteorologists in the Weather Bureau Central Office are paid from this source.

We call the fallout forecasts UF winds by virtue of their communications heading on the teletype circuit. The UF winds tell where the fallout may be and when it will get there.

As yet, the Weathetr Bureau is routinely transmitting no dosage estimates. The ability to estimate dosages given the bomb yield and other essential information is limited, in the Weather Bureau, to a few scientists who have been engaged in specialized research for the Atomic Energy Commission and the Department of Defense.

The Weather Bureau believes that the dosage prediction problem can best be solved by the use of electronic computers.

Mr. BALWAN. Does this mean that you people are not concerned or have the capability because of scientists to predict dosages as well as general direction of fallout?

Dr. MACHTA. That is correct, sir. The Weather Bureau field offices do not have this capability. It is limited to a very few people who have access to data provided by the Atomic Energy Commission. I offer a suggestion in the next paragraphs which we think is a practical way to predict radioactive dosages.

It is possible, at present, to predict radioactive dosages from a given wind structure by using highspeed electronic digital computers in about 20 minutes. One may obtain a hand computation in about 30 minutes which provides much less detail.

However, with the financial assistance of the Atomic Energy Commission and under the Weather Bureau direction, the National Bureau of Standards has constructed an ingenious electronic analogue fallout computer.

This device instantaneously displays the geographical distribution and dosage pattern of radioactive fallout visually on the face of a television-like tube.

Mr. BALWAN. Dr. Machta, I believe you have an exhibit that you might describe this more fully.

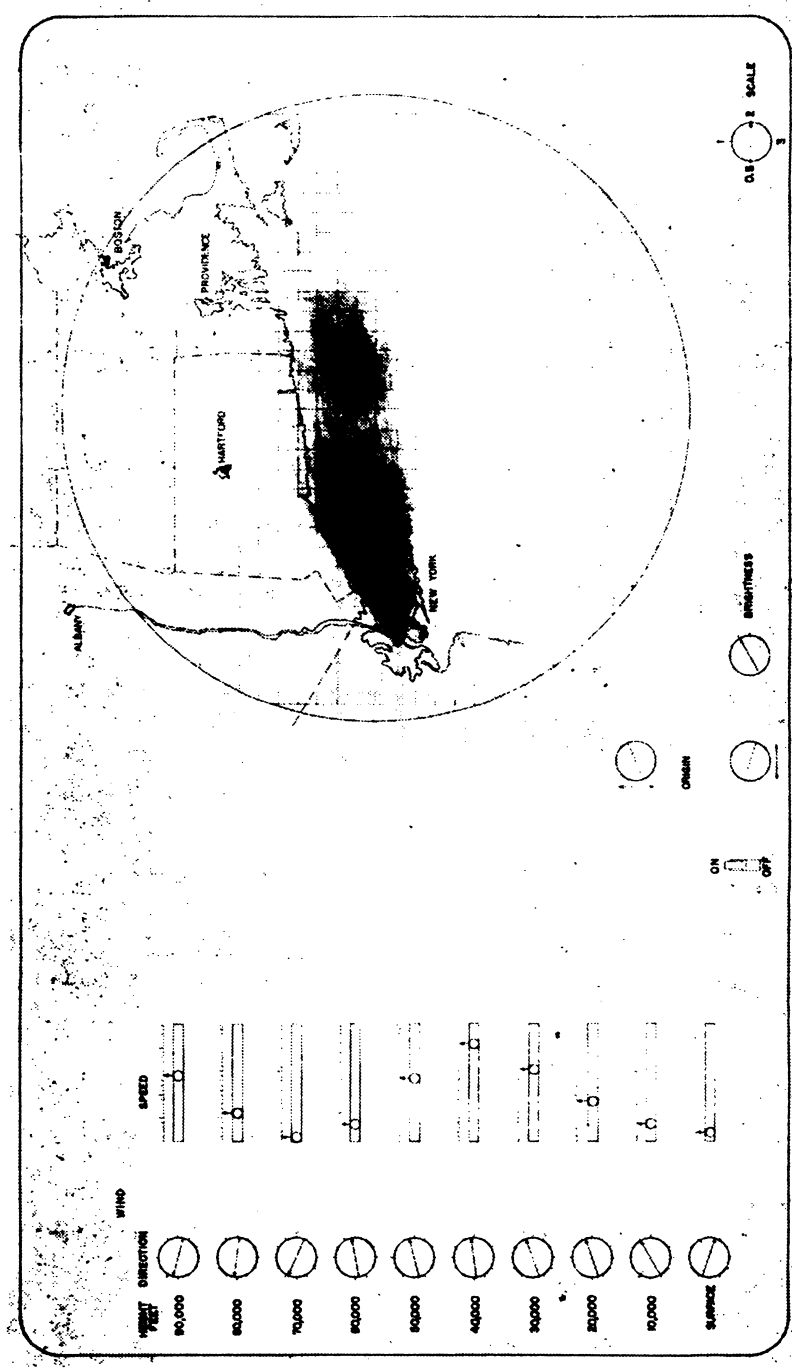
Would it be of any use for the subcommittee using an electronic analogue computer and a digital computer?

Dr. MACHTA. Yes, there is a significant difference. An electronic digital computer, such as Remington Rand or IBM produce, costs in the order of 2 or 3 million dollars. It covers about half the area of this room. An electronic analog computer would occupy a tenth of the area of this desk, would cost less than $10,000, but would predict only fallout. An electronic digital computer is more versatile.

This analog fallout computer consists of a series of knobs (see chart No. 2) for each altitude above the ground up to perhaps 90,000 feet or 100,000 feet in which a setting for the wind direction and wind speed would be made for the appropriate altitude. Another series of knobs not shown here would be set for the yield of the weapon, for the height of burst and for any other information which is necessary.

(Chart No. 2 referred to follows:)

CHART NO. 2—ANALOGUE FALLOUT COMPUTER PORTRAYING FALLOUT FROM HYPOTHETICAL BOMB DROP OVER MANHATTAN



Dr. MACHTA. On the face of a television tube, one would see the brightness proportional to the radioactive intensity. If one were to overlay a transparent map on this pattern one may note the area affected by fallout. From this pattern and the map overlay, we get an idea of the fallout pattern from an explosion taking place over New York City and thus we may give the civil defense director an idea of the direction toward which the fallout will occur in the event of an enemy attack.

Mr. ROBACK. Mr. Chairman, may I ask here, Dr. Machta later in the statement makes the point that obviously one will not know what the characteristics of the enemy weapon are since the enemy is not telling about it before they drop it.

How can you measure dosage here without some kind of specific dosage measurement, without somebody going out and actually measuring somewhere so you can project?

Dr. MACHTA. This is a prediction of what would happen if the enemy would drop a bomb of a given yield. We would have to obtain statements of estimates from FCDA of their guess of the maximum likely yield of the weapon the enemy would drop. This would be set in the machine in a pre-attack pattern to determine the pre-attack fallout pattern.

After the attack, if the information were available as to the yield of the weapon, its height of burst and knowing it occurs over a city, let us say, one could adjust the knobs and then determine a more realistic and likely fallout pattern.

Mr. ROBACK. My question is this: Is there a substitute for measuring actual dosages in areas which are subject to the question, shall you keep out of them or go into them?

Dr. MACHTA. The answer is very definitely no. One must monitor to find cut what the dosage is.

Mr. ROBACK. This would be most useful in exercises.

Dr. MACHTA. It is true that it is very useful in exercises but the computer prediction would be useful as a guide if nothing else were available.

Mr. HOLIFIELD. Having had some experience with the South Pacific in these things, these tests, of course, the computation of the different instruments, which have to do with the blast power and the thermo-power and the radioactive power in every instance of course those computations are made with the basic knowledge of exactly where the bomb is exploded, how high it is exploded from the ground and with the knowledge of the type of dust or coral or whatever it happens to be underneath it.

As we are now set up in the United States, all these different target areas are vulnerable to attack and without the scientific instruments to register impact, force velocity, dosage, and the other pertinent factors, is it not true that you will be lacking basic information to feed into these machines even if they are available?

Dr. MACHTA. Your statement is entirely true and it is for this reason that the Weather Bureau at the moment is not providing dosages. The area into which fallout will occur is largely independent of the parameters you have just mentioned and we can estimate the area and the time of arrival almost exclusively from pure weather data and it is only this information which we are now transmitting.

Mr. HOLIFIELD. This information would be useful particularly as a guide to evacuation, would it not?

Dr. MACHTA. It could be useful of course to advise people to take shelter.

Mr. HOLIFIELD. The point I mean is, if you have a general wind direction regardless of whether you know the dosage, the exact dosage or not, you would know that this was one area that you would not want to evacuate into.

Dr. MACHTA. Absolutely, sir; yes, sir.

Mr. BALWAN. I think Dr. Machta later says also that this has usefulness in directing detection teams, in telling them what area to go to, at least.

Mr. HOLIFIELD. To monitor the exact dosage.

Dr. MACHTA. Yes, sir.

The input data—on this electronic analog computer—such as winds, yield, and height of burst are introduced as dial settings which require no skill on the part of the operator.

It is our hope that a version of this machine can be employed by those active civil-defense communities which are prepared to use the resulting information. But it must be emphasized again that computations of dosage patterns can only be made if the yield of the bomb, its height of burst, and other data are known—a situation not likely to prevail in the event of an enemy attack at this time. However, numerous research groups are actively grappling with this problem and there are plans for its solution.

I would now like to turn to a climatological study which we are making in the Weather Bureau.

The Federal Civil Defense Administration and other agencies are anxious to know which directions from any target city are most likely to be safe from fallout. New industrial construction and emergency storage facilities can be located where they will be least endangered. A study to obtain this kind of data has been recently authorized for the Weather Bureau and good progress is being made in its execution.

The final results are to be presented by seasons, the summer study will be ready on May 15, 1956; the fall study on June 15, 1956; the winter study between July 15 and August 1, 1956; the spring study on September 1, 1956.

The results will permit one to judge also the relative desirability—falloutwise—of, say, a plant location northeast rather than southeast of a potential target. One will be able to estimate the average number of hours of warning, after a bomb drop, each locality will have before the fallout begins. Further, if no current weather data is available at the time of an attack, these statistics will represent the only estimates of likely fallout sectors a civil defense director may have.

Mr. MORGAN. Do you have any illustrations or charts with you that you might explain this a little more fully to the subcommittee?

Dr. MACHTA. Yes. (See chart No. 3.)

This is a hypothetical example of the kind of results which we hope to obtain from our climatalogical study. The city being used as the target is Detroit, Mich. These isolines shown in heavy black represent the probability of fallout occurring within 3 hours after a bomb has been dropped on Detroit, so that for example, at Buffalo the probability that the fallout will occur as soon as or sooner than 3 hours from an explosion which takes place at Detroit is only 10 percent.

(Chart No. 3 referred to follows:)

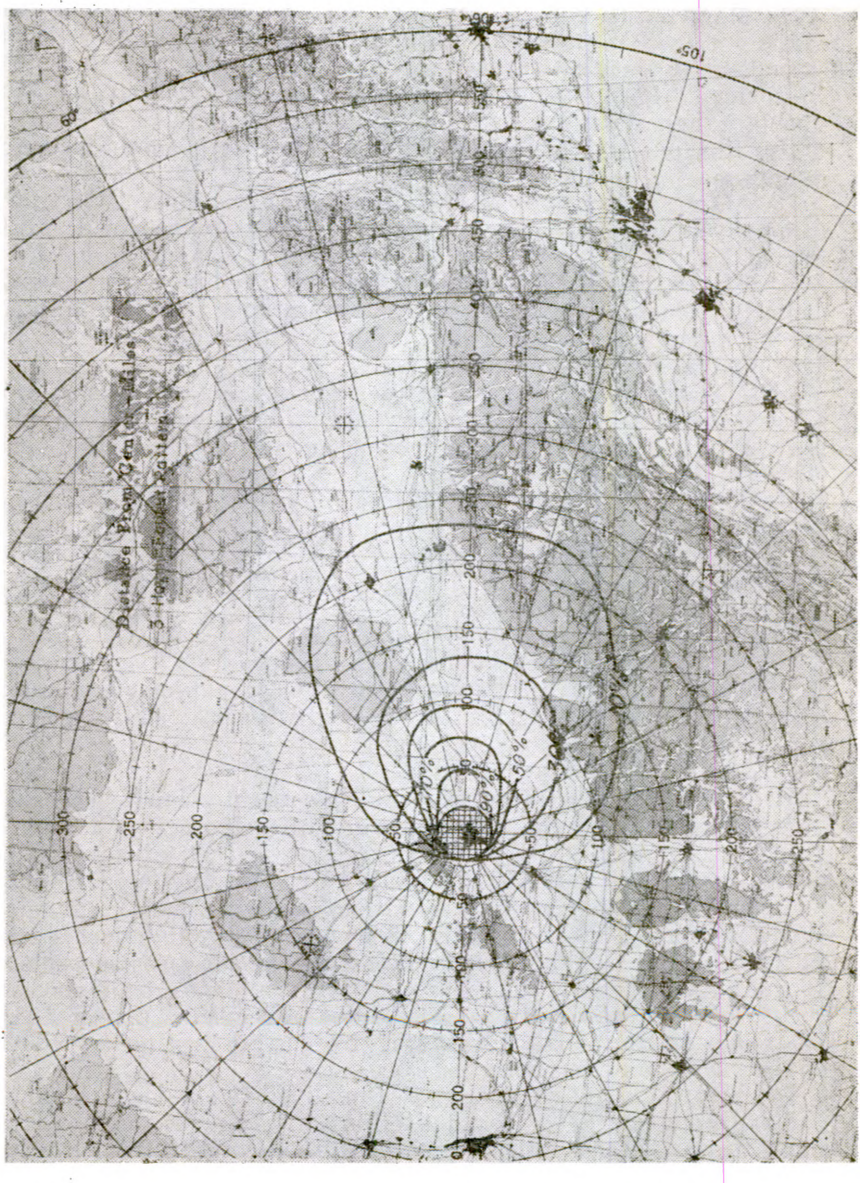


CHART No. 3.—HYPOTHETICAL EXAMPLE OF RESULTS EXPECTED FROM FALLOUT PROBABILITY STUDY

Dr. MACHTA. We will have like statistics to show the likelihood of fallout occurring in 6 hours after the time of an explosion and for 12 hours.

Mr. ROBACK. What bomb are you using in that example?

Dr. MACHTA. In this case we do not have to specify the exact yield of the weapon. We need only assume that the mushroom of the cloud extends up to about 80,000 feet, to which almost every megaton bomb will extend. It is unnecessary to specify the exact yield of the bomb to obtain these statistics.

Mr. ROBACK. It is above the kiloton range, it is in the megaton range.

Dr. MACHTA. Yes, it is in the megaton range. By and large the fallout from weapons in the kiloton range do not offer a widespread hazard.

Mr. HOLIFIELD. If they go to the trouble of delivering transcontinentally a bomb it would be in the megaton range rather than in the kiloton range because of the expense of delivery and the hazard and percentage of defaults and aborts and so forth.

Dr. MACHTA. One might go further and say if they were to drop a bomb in the kiloton range they would probably not use it for the purpose of endangering us with fallout, but for its blast and thermal effects.

Mr. HOLIFIELD. I notice another large city to the left of zero there, what city is that?

Dr. MACHTA. This is Chicago, sir.

Mr. HOLIFILD. Assuming that the prevailing wind was easterly and I suppose that is what you have——

Dr. MACHTA. This way, from west to east.

Mr. HOLIFIELD. And if bombs were dropped in Chicago as well as in Detroit, practically simultaneously, you would have the area in between Chicago and Detroit also covered with radioactivity, would you not?

Dr. MACHTA. This is correct, sir.

Mr. HOLIFIELD. Therefore, with multiple megaton bursts where you have target areas within 200 or 300 miles of each other—and most of the northern part of the United States is in that situation—your general pattern of radioactivity would be fairly wirespread, would it not, there would be very few areas that would not be contaminated.

Dr. MACHTA. That is correct. If the enemy were to launch a saturation attack, it would be hardly necessary to have any meteorology. It wouldn't make any difference which of the bombs made you take shelter. Practically every area would be so heavily contaminated.

Mr. HOLIFIELD. This likelihood, if it occurs, does it not cast doubt on the theory of evacuation?

Dr. MACHTA. I do not feel myself qualified to speak on this.

Mr. HOLIFIELD. Let's look at it this way. In view of the large populations of these cities, in view of the fact that we have had testimony to indicate that there will be less than 3 hours warning time for bomber attack, an exercise in mathematics relating to the movements of people would indicate that they could not be moved 250 miles within a period of 3 hours.

Dr. MACHTA. Yes.

Mr. HOLIFIELD. And therefore if they were moved in the direction of prevailing wind, they would still be in the area of fallout.

Dr. MACHTA. Yes.

Mr. HOLIFIELD. In that case, it seems to me that shelter becomes more important in the future than evacuation, we should be exploring the possibilities of shelter rather than evacuation, if we are talking about a surprise attack. If we have weeks of warning, that is a different situation of course.

Dr. MACHTA. The material which the Weather Bureau is providing I think goes along with this kind of reasoning, in that we are able to tell, after a bomb goes off, how much time one has to store things in shelters so as to be able to live there for a few days. After the bomb goes off, almost any downwind city has anywhere from 15 minutes to 6 or 8 hours before the fallout occurs.

If you can put provisions in your shelter, one can live there for days, I would think.

Mr. RIEHLMAN. If the winds are predominantly toward the east, following your discussion, and bombs were dropped on Chicago, Detroit and Pittsburgh, then it would be just absolutely hopeless to evacuate any city in New York State.

There would be no possibility for that whatsoever. It gets back to your suggestion that the people do whatever they can to protect themselves and take cover right where they are, because there would be no place for them to evacuate to. They would not have time enough to get to an area that would not be contaminated.

Mr. HOLIFIELD. Even your distances north and south from your target center becomes a matter of 100 to 150 miles and that itself would preclude evacuation within a period of 2 or 3 hours.

The width of your directional fan there, the wide part in this instance would occur near the city of Detroit even though it were dropped over the city of Chicago.

Dr. MACHTA. Yes. May we bring in a different illustration to bring out this point?

Mr. HOLIFIELD. Yes. I wondered if you had some multiple——

Dr. MACHTA. This illustrates (see chart No. 4) the kind of sector in which the far downwind fallout will most likely occur.

(Chart No. 4 referred to appears on page 612.)

Dr. MACHTA. It is the area shown on the figure labeled "Mushroom head fallout sector." This tells us for one individual bomb, roughly how wide a sector will be affected. If one were to have another detonation at Cleveland, you would put out another one there, and so on.

The entire area would be essentially contaminated by fallout.

Mr. BALWAN. This is not an area of equal contamination. This has nothing to do with dosage.

Dr. MACHTA. That is correct. There will in all likelihood be some radioactivity here, but no dosages are shown.

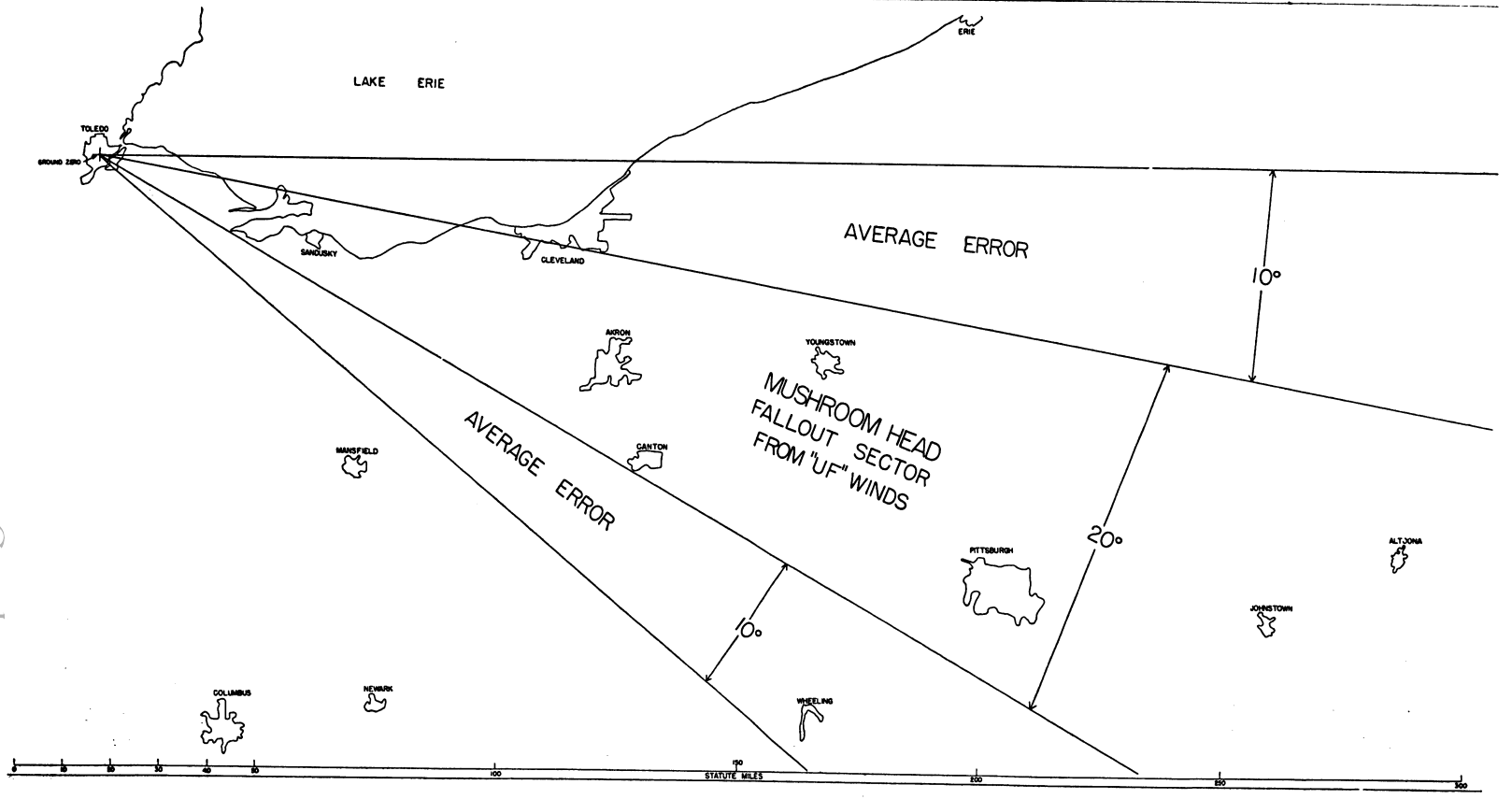
Whether Youngstown in this illustration would be subjected to a dosage which would be lethal if people stayed outdoors or whether Canton would be so affected we would be unable to say.

Mr. MORGAN. Dr. Machta, this is not unrealistic then, that such as this could occur in the New England area, is it?

(Chart displayed).

72796—56—pt. 3——2

Chart No. 4—Illustration of Far Downwind Fallout Sector



Dr. MACHTA. Not at all, sir. It could be much worse than that, if the attack were heavier.

Mr. HOLIFIELD. Your dosages would be increased in all areas where there was overlapping of fallout?

Dr. MACHTA. Yes, sir.

Mr. HOLIFIELD. We cannot reasonably assume that your fallout downwind would be confined to one directional movement of air at a particular level, can we?

Dr. MATCHA. No, sir.

Mr. HOLIFIELD. In other words, the trouble we got into out in Eniwetok was compounded of several things, of course, but certainly one of the factors was that the yield was higher than the scientists expected and the upward column of debris went higher than they expected and it was carried downwind in directional slants at levels which had not been predicted. The high-level winds, in other words, if I make myself plain, at different levels your direction might go like this.

If it is only going to go let us say 40,000 feet high, this wind would carry it, but if it went fifty or sixty thousand feet high and got into another current, it would spread out your fan. In other words, you would have 2 or 3 fans at different levels, would you not?

Dr. MACHTA. Yes, sir. Along the same line, sir, we recognize that the forecasts which we are providing are by no means perfect and we are obtaining statistics on the error in the area covered by the mushroom head fallout—which we believe to be the dangerous fallout. While we might predict a sector in the east-southeast direction we recognize that if the bomb were to be detonated 12 hours later and we are making a prediction based on the present winds an error of 10° on either side might, on the average, occur.

Mr. HOLIFIELD. There could be a degree in the shift of the main wind current that would carry it at least 10° to the right or left.

Dr. MACHTA. Yes. That is the sector correction required for a 50 percent likelihood of the fallout occurring within the predicted area. If one wanted a 90 percent likelihood, the error sector would have to be enlarged.

Mr. HOLIFIELD. Without casting reflection on the science of prediction, because I realize we are getting into a new field which we are exploring, it would be safe to say that as of now, the Weather Bureau is not equipped to furnish accurate predictions of fallout for the principal target areas of the United States, for each hour of the day or rather—yes, let us say each part of the day, not hour.

Dr. MACHTA. I don't believe this is quite a fair statement.

Mr. HOLIFIELD. I am putting it in the form of a question.

Dr. MACHTA. I would say we can furnish information which, with limitations, would be of considerable value. It is seen that the average error is, after all, only about 10° and it would be more desirable to know that the fallout would lie to the east-southeast rather than in the sector or to the south in a sector to the north.

Despite the fact that we cannot predict with perfection by limiting the area of fallout to a relatively narrow sector, we are providing advice which a civil-defense director can usefully employ.

Mr. ROBACK. 50 percent of the time that would be the sector; 50 percent of the time the sector could be anywhere in the circle.

Dr. MACHTA. Yes. We would then have to provide the civil-defense director with additional statistics which might increase the sector by 20° of 30° if he wanted, say, 90 percent confidence of the true fallout occurring within the predicted sector.

Mr. HOLIFIELD. Your basic interpretation rests upon knowledge of where the bomb was exploded in terms of latitude and in terms of altitude and also the power of the bombs does it not?

Dr. MACHTA. No. These calculations of the area in which some fallout might occur are independent of the nature of the bomb. If the burst is sufficiently high so the fireball does not intersect the ground, our predicted area of fallout would have no radioactivity within it. This is an analysis made largely from winds.

Mr. HOLIFIELD. Then your element of uncertainty there is dosage?

Dr. MACHTA. That is correct, sir. We don't know whether one has to worry about conditions say at Johnstown which is 300 miles away or not.

Mr. HOLIFIELD. Now tell me this, what reliance can you place upon prevailing winds as of say the quarters of the year? Do they change during the term of the year? In other words would the general prevailing wind, let us say, from Chicago be northeast all during the year or would it change and go in some other directions at certain times of the year?

Dr. MACHTA. May I show you the next picture to illustrate this?

Mr. HOLIFIELD. Yes.

Mr. BALWAN. You also have charts which show the change not only by seasons but within 5 successive days?

(Chart No. 5 referred to appears on the following page.)

Dr. MACHTA. This chart (see chart No. 5) shows the patterns of the directions of wind in the winter season and in the summer season. You can see that in the Northwestern part of the country in the winter we have winds blowing from the northwest, whereas in summertime they blow up from the southwest. By and large except in the Southern portion of the United States in the summertime the winds blow from west to east on the average although the speeds which are the numbers on the charts are much greater in the winter than they are in the summertime.

Mr. HOLIFIELD. That is true at all altitudes?

Dr. MACHTA. This is typically true at almost all altitudes. Yes, sir.

Mr. HOLIFIELD. Although there is some variance in different altitudes in winds, currents and directions.

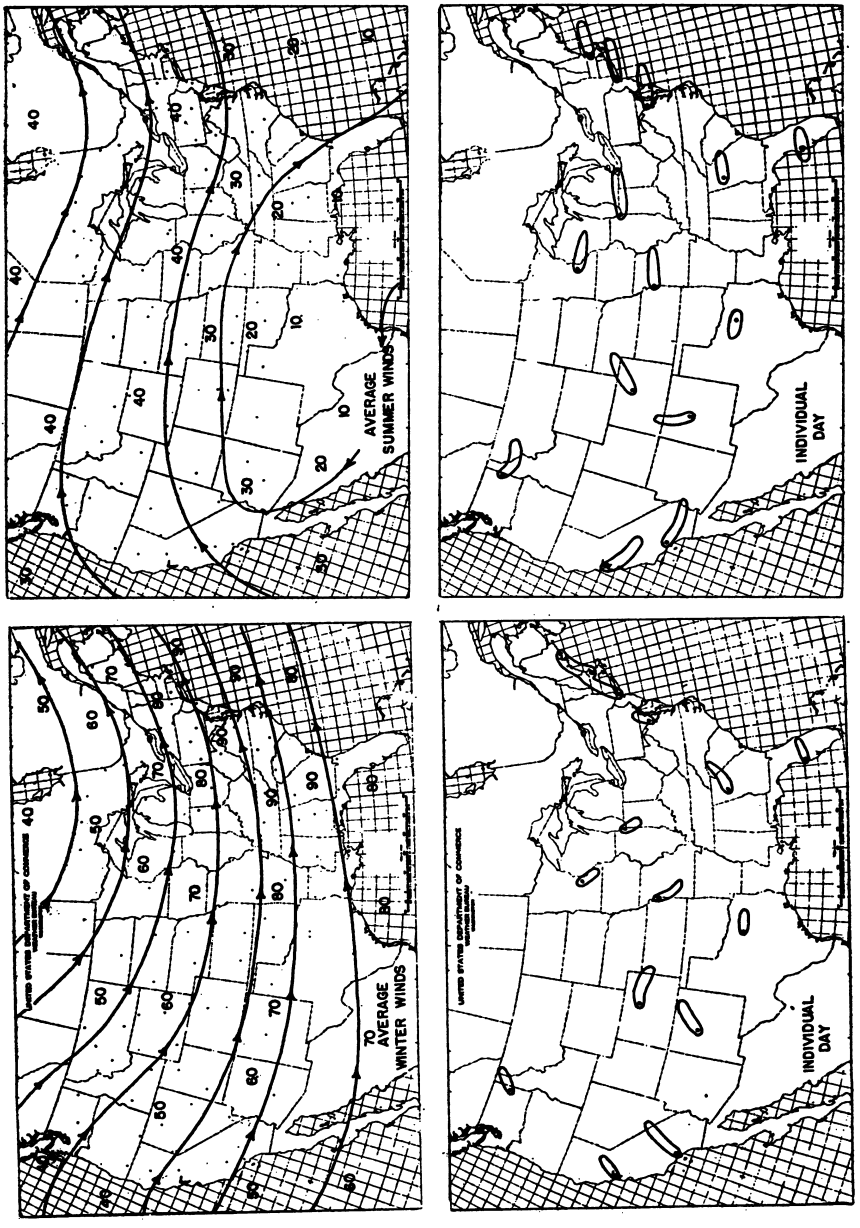
Dr. MACHTA. That's right. In the lower part of the illustration are hypothetical fallout patterns for individual days. The dots show the hypothetical ground zeros. The diagrams show that on some days the fallout in the West is carried with southwest winds and, on other days, which might be in exactly the same season, with northwest winds.

There is a large variability, although if you had to pick some prevailing wind direction it would be from west to east.

Mr. HOLIFIELD. The local changes in direction, what you would call I guess the secondary directions are quite variable.

Dr. MACHTA. Yes, as illustrated by the lower part of this figure your statement is essentially correct. That is why it is necessary to provide forecasts of the likely fallout sectors. In our opinion this is

CHART NO. 5—VARIABILITY OF FALLOUT AREAS AND UPPER WINDS



the best way we can provide indications as to whether fallout will occur to the southeast or northeast of ground zero.

Mr. HOLIFIELD. Are you equipped as of now to give daily predictions as to directional wind movements?

Mr. MACHTA. We have since June 1, 1955, been providing such forecasts of the direction toward which fallout will occur on a twice daily basis.

Mr. HOLIFIELD. To how many primary target centers?

Dr. MACHTA. The outlets on the teletypewriter circuits which receive this information number over 500 in the United States. We have information, for example, that in California there are 154 localities which are routinely plotting the direction toward which the fallout will occur. This is information which is received from the Weather Bureau.

Mr. HOLIFIELD. Daily plotting.

Dr. MACHTA. Twice daily. If we had wind observations taken 4 times per day and had communications time we would send them out 4 times each day.

Mr. HOLIFIELD. Do you have any idea of the efficiency of the receiving stations in taking advantage of this information that goes to them?

Dr. MACHTA. I personally am not aware of this, but I think FCDA does have information on this subject.

Mr. HOLIFIELD. Does this teletype information go out over the Weather Bureau's teletype or does it go over the general FCDA system?

Dr. MACHTA. We are using our weather teletypewriter circuits to transmit the fallout information. However, in the case of the State of California, we understand we give our information to one place in the State and they retransmit it over their own internal circuits to the one hundred and fifty-odd stations.

Mr. HOLIFIELD. Is that prediction in California one prediction for the whole State or does it take into consideration different sectors of the State?

Dr. MACHTA. The upper wind observing stations which are in the program in California are Oakland, Long Beach, and San Diego. We might add Medford, Oreg., and Los Vegas, Nev., which are adjacent to California. We advise each one of the localities of the closest fallout report which would be applicable should fallout take place in in their area. Differences in points as close together as between stations in our wind network are not, in our opinion, very significant.

Mr. HOLIFIELD. In other words your wind current there, does it move north and south or east and west?

Dr. MACHTA. By and large the wind currents move from west to east.

Mr. HOLIFIELD. West to east?

Dr. MACHTA. Yes, sir.

Mr. HOLIFIELD. Then the same information goes to San Francisco that goes to Los Angeles.

Dr. MACHTA. Yes. In fact everyone of the cooperating stations in this network appears on the teletypewriter circuit and is picked up by every other Weather Bureau, CAA, and military weather station.

Mr. HOLIFIELD. Where does the basic information originate, does it originate at these stations or does it originate at a central station and go back to them?

Dr. MACHTA. It originates at each station which takes the upper wind observations.

Mr. HOLIFIELD. Do they send that information into a central location for screening and then play back?

Dr. MACHTA. No, sir. As the time approaches for them to put it on the teletypwriter they await their turn and each one in succession puts its information on the teletypewriter.

Mr. HOLIFIELD. I am trying to find out now if the people of San Francisco are depending upon their local San Francisco weather station for this prediction or are they depending upon the central bureau here in Washington?

Dr. MACHTA. The people in San Francisco are totally independent of Washington. They have two sources in San Francisco. One, they could call directly to the Oakland weather station and obtain the data or they could get it from an outlet on the teletypewriter circuit.

Mr. HOLIFIELD. But the teletype circuit originates in Washington; does it?

Dr. MACHTA. It covers the entire country. It has no point from which all the rest of the information is transmitted.

Mr. HOLIFIELD. It is composite reporting.

Dr. MACHTA. Yes, sir. The last few remarks which I have to make have largely been covered but may I present them?

Mr. HOLIFIELD. Go ahead. We would like to have them in order.

Dr. MACHTA. The present UF winds or fallout forecasts as we have been talking about them are merely an analysis of the latest wind observation. We recognize that the lack of true forecasting leaves room for improvement.

However, because of the nature of fallout winds the latest observation is a fairly good forecast for conditions many hours later. Thus fallout from the mushroom head of the nuclear cloud after 12 hours lies within an angle of about 10° of the UF predicted sector on the average. It is this mushroom head fallout which is dangerous far downwind. Further, the forecast sector is rather narrow—less than 20° in angular spread, on the average, in fact usually less than 10°, so that we can fairly accurately limit the sector of downwind hazard to a reasonably small angle out of the 360° around ground zero.

Mr. HOLIFIELD. At this point for the record it would be well to state if we are going to have any information of value to the civilian defense, it must be on the basis of at least daily or twice daily forecasts, by the station which has access to means of detecting in that particular area.

Dr. MACHTA. Yes, sir.

Mr. HOLIFIELD. At least twice daily.

Dr. MACHTA. In fact if we had our way those of us involved in civil defense would have reports four time a day.

Mr. HOLIFIELD. I see. Any civil-defense plans for any part of the day would of necessity have to take into consideration this information; would it not?

Dr. MACHTA. Yes, sir.

Mr. HOLIFIELD. And the plans would therefore vary with the wind direction——

Dr. MACHTA. Yes.

Mr. HOLIFIELD. When it came to the necessity of taking immediate shelter and the possibility of evacuation?

Dr. MACHTA. Yes. Even the use of the latest observation has its limitations because our upper wind observations frequently fail to reach the altitudes to which nuclear clouds can rise. This is normally not critical, if the wind observation reaches about 50,000 feet, since the winds above this level rarely enlarge the fallout sectors very much.

The Weather Bureau is conducting research to incorporate forecasting winds in the UF program. The most promising approach is the use of the wind forecasts up to 25,000 feet made at the Joint Numerical Weather Prediction Unit which employs a high-speed electronic digital computer.

This machine, used exclusively for meteorology, is producing forecasts which are competitive with conventional forecasts. If this procedure is successful, it may be preferable to compute both fallout areas and dosages at central locations and transmit the results via high-speed facsimile equipment to local civil-defense organizations.

Mr. BALWAN. Where is this located?

Dr. MACHTA. At Suitland, Md.

Mr. HOLIFIELD. You are talking about the use of one of the big IBM machines.

Dr. MACHTA. This is correct. We would adapt this forecast to also predict the necessary winds for civil defense.

Mr. HOLIFIELD. And would that be a service that could be obtained from a large machine centrally located or would you have to have a number of those machines?

Dr. MACHTA. My opinion would be that in order to be safe, one should have several such locations.

In the field of instrumentation, the Weather Bureau and the military services are developing techniques to reach 100,000 feet routinely for wind determinations.

Mr. HOLIFIELD. That, however, goes into the stratosphere.

Dr. MACHTA. Yes.

Mr. HOLIFIELD. And isn't it true as you have already indicated previously that our chief concern should be in ionosphere as far as local contamination is concerned? We had some testimony from Dr. Libby in which he indicated that a bomb of a 10-megaton force would pierce the stratosphere and he said a great deal of the radioactivity would therefore be dispersed widely in the stratosphere rather than falling out. At that point I clarified the record to the extent of questioning him about the 7,000 square mile pattern which he testified about.

He indicated that that was all from the portion of the radioactivity which remained in the ionosphere and which was spread by prevailing winds, down winds from Eniwetok. The point I am getting at is that we are really concerned chiefly with bomb yields which disperse their radioactivity in the ionosphere rather than the stratosphere.

Dr. MACHTA. May I state that actually the atmosphere is divided up into a troposphere, which exists from the ground up to about 30,000 feet in the temperate latitudes and above that the stratosphere. Dr. Libby's remarks, I should say, may have referred to the fact that most of the debris which falls out in the 7,000 square miles was located in the troposphere.

Mr. HOLIFIELD. I used the wrong word. I should have said troposphere.

Dr. MACHTA. There is at the moment a difference of opinion as to whether the fallout which occurred in the 7,000 square mile approximately in the first Pacific shot came from the troposphere or the stratosphere. It is our own opinion—this is purely an opinion since the data does not conclusively prove it—that the close-in fallout originates largely from the stratosphere. I would disagree in this case with Dr. Libby and therefore argue that we do require information from the stratosphere—to 100,000 feet or higher.

Mr. HOLIFIELD. In other words your wind current above 35,000 feet, you say is the troposphere?

Dr. MACHTA. The tropopause is at 35,000 feet in the temperate latitudes. In the tropics it is at about 60,000 feet.

Mr. HOLIFIELD. That is why he used 60,000 on the Eniwetok computation I guess. Your winds above that, they are not strong enough ordinarily to retain the dust at that altitude and cause it to circle the earth in a widely dispersed condition.

Dr. MACHTA. I think we are talking about two different items. One refers to those particles which are large enough to fall out within the first 18 hours or so. These will fall out irrespective of whether they are located below or above 60,000 feet. Those particles which are small and possess very small fall velocities will circulate around the world. These small particles largely reside in the stratosphere and it is these particles which have not yet fallen out. We may want to know when they too will fall out.

Mr. HOLIFIELD. But as far as your prediction is concerned of a fallout pattern, aren't you chiefly concerned with the fallout that occurs below 60,000 feet?

Dr. MACHTA. We are concerned with fallout from all levels up to, in this case, 80,000 feet. We are considering the possibility of fallout that is occuring from as high as 80,000 feet.

Mr. HOLIFIELD. Do you have information to show that the heavier particles do reach a height above 60,000 feet?

Dr. MACHTA. Can I answer the question slightly differently? In the case of the Nevada tests where we have very good information concerning the height at which the fallout particles originate, we do know that most of the large particles which fall out come from the mushroom head of the cloud.

The mushroom head is the large part of the nuclear cloud. The data which is available from the Pacific does not clearly indicate whether the particles that produced the large heavy fallout locally were or were not initially in the stratosphere. Our best guess from results which we get from the Nevada tests indicate that the close-in fallout comes from the mushroom head. In the case of the Pacific March 1 test, the mushroom head is above 60,000 feet. We are extrapolating from the Nevada tests to the Pacific tests in lieu of conclusive information about the Pacific tests.

Mr. HOLIFIELD. In your Nevada tests the mushroom does not go above 60,000 now?

Dr. MACHTA. That is correct.

Mr. HOLIFIELD. In fact it does not go above thirty-five or forty thousand now?

Dr. MACHTA. That is correct, sir.

Mr. HOLIFIELD. Of course, you are using small bombs there, you are using bombs in let us say roughly less than a hundred kilotons, whereas in these higher mushrooms, you are going then into the millions of tons.

Dr. MACHTA. Yes.

Mr. HOLIFIELD. So you have quite an extrapolation to make there from your Nevada tests to the Pacific tests, have you not?

Dr. MACHTA. Yes, sir. I may add that this viewpoint of placing most of the radioactivity which falls out close in originally in the stratosphere, above 60,000 feet, is held by almost everybody who has been working in the fallout business. There are only 1 or 2 exceptions to this and we are in this case going along with the majority opinion.

Mr. ROBACK. Do you mean that the Atomic Energy Commission is one of the few people who take exception to this prevailing view?

Dr. MACHTA. I would like to see what Dr. Libby has stated to see whether or not there is in fact any conflict. We do not feel that we disagree with the AEC on this matter.

Mr. ROBACK. Mr. Chairman, may we have a commentary by the Weather Bureau on Dr. Libby's testimony as it pertains to their understanding and findings in this field?

Mr. HOLIFIELD. Would you be willing to give us an opinion on his testimony if it were submitted to you?

Dr. MACHTA. By all means, sir.

Mr. HOLIFIELD. It is my opinion that his statement was clarified by questioning but it was ambiguous as first given, because it led to the conclusion that because the bomb force went into the stratosphere that a great deal of the radioactivity was dissipated widely and did not affect the surface.

Dr. MACHTA. This is true for the residual fallout, sir, not for the immediate fallout.

Mr. HOLIFIELD. But the immediate fallout is not fallout that goes into the stratosphere, it is fallout that is carried by the wind currents in the troposphere, is it not?

Dr. MACHTA. That is where there is a difference of opinion.

(The following supplementary statement was submitted by Dr. Machta:)

SUPPLEMENTARY STATEMENT OF DR. LESTER MACHTA

In the course of questioning by Representative Holifield of Dr. L. Machta on March 13, 1956, it appeared as though the testimony given by Dr. Machta was not in accord with that of Dr. Libby, who had testified before the Holifield committee on January 31, 1956. In response to a request for clarification of this item by Mr. Roback, director of investigations, the following commentary is offered.

The point in question deals with the likely origin of the large particles which produce the close-in fallout during the first several hours after a surface detonation of a nuclear device whose cloud reaches well into the stratosphere. Dr. Machta contended that these particles fall mainly from the stratosphere whereas it was Mr. Holifield's recollection that Dr. Libby's testimony placed these particles initially in the troposphere. The following testimony by Dr. Libby pertains to this question:

"Mr. HOLIFIELD. * * * It might be thought that the big weapons did not leave enough radioactivity in the tropopause to make them tremendously deadly in the radioactive sense.

"Dr. LIBBY. * * * You are correct. No, it is a fraction of it which is left downstairs, but this fraction is very dangerous.

"Dr. LIBBY. * * * that is, the material which falls out immediately within the first few hundred miles is not the material which generally goes into the stratosphere and fall right back down.

* * * * * * *

"Dr. LIBBY. * * * Of course, some of the large local fallout may be in big particles which are lifted in the stratosphere which drop right back."

From the above comments by Dr. Libby one can readily understand Mr. Holifield's position. It is clear that the statements of Dr. Libby do not clearly and consistently argue that the close-in fallout originates in the stratosphere. Further, on March 15, 1956, Dr. Machta telephoned Dr. Libby to clarify this point. Dr. Libby agreed that a statement concerning the origin of the large particles which produce the local fallout as being mainly in the stratosphere was not in contradiction with either his testimony nor with his views on the matter.

In conclusion, therefore, the position which the Weather Bureau holds concerning the needs for wind observations at altitudes into the stratosphere because of the presence of large amounts of radioactivity in that layer which will fall out close-in is not at odds with the views of Dr Libby.

Mr. HOLIFIELD. All right, you may proceed.

Dr. MACHTA. The Weather Bureau is also conducting research for the Atomic Energy Commission and the Department of Defense leading to more reliable dosage estimates. The outcome of these studies can be directly applied to civil defense needs.

We should like to have our fallout forecasts viewed for what they are: rough estimates of areas and arrival times of fallout.

For preattack plans, they represent the only information a civil-defense director will have to guide him in estimating likely fallout sectors. As long as their limitations are appreciated, they should be invaluable. In the postattack phase, they are not intended to be a substitute for monitoring. However, if survey facilities are limited, the meterologist, with the UF winds or subsequent weather data, can tell where the monitoring teams should be vectored to obtain the measurements of radioactivity.

It should be pointed out that even if good forecasts are available but if ground zero is unknown the fallout area obviously cannot be estimated or in the case of a saturation attack it is rather irrelevant which bomb forces the population to take shelter.

Mr. HOLIFIELD. If there is a saturation attack, evacuation becomes dangerous if not impossible.

Dr. MACHTA. This is your view, yes. We as weather people would like to take no position on this issue.

Mr. HOLIFIELD. All right.

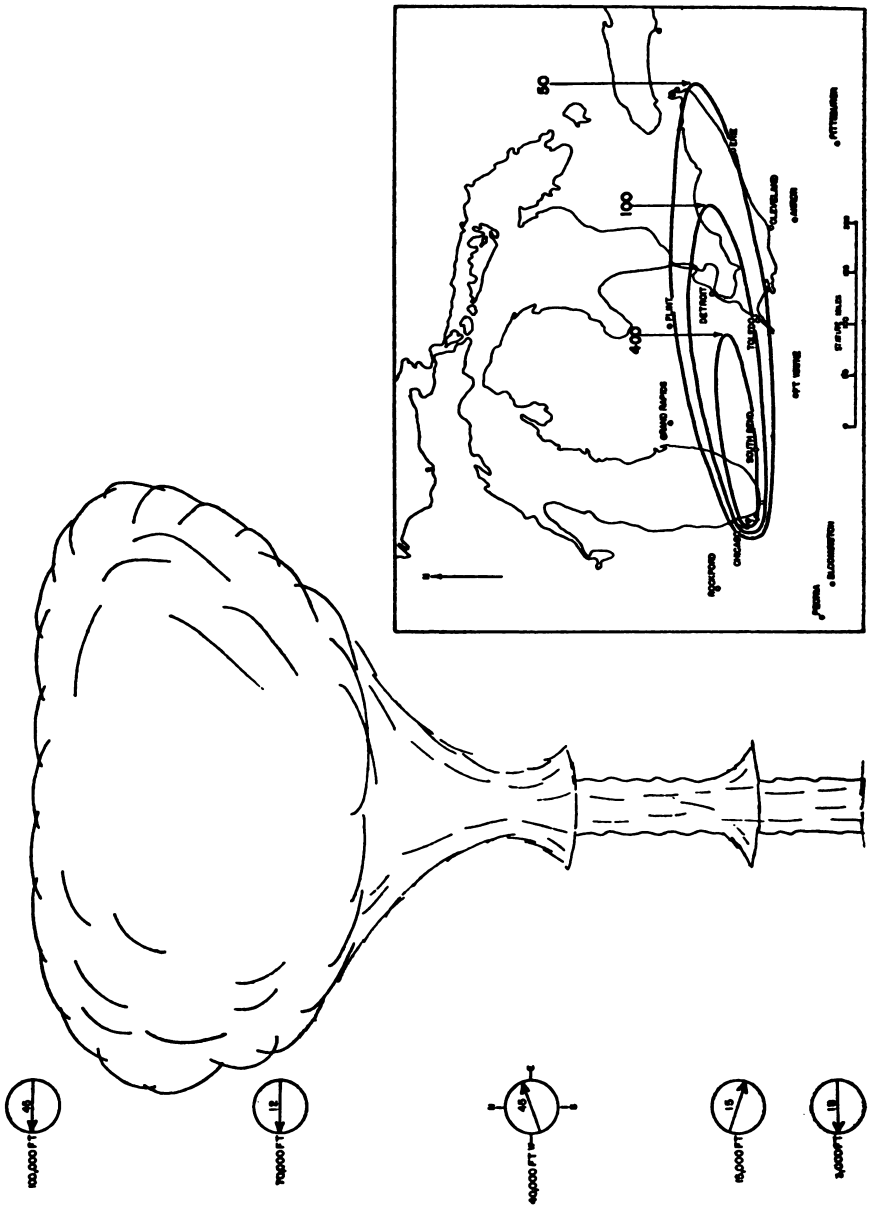
Dr. MACHTA. Our plans call for the continued operation of the UF fallout forecasting program since it does yield valuable estimates for the civil-defense official. We will continue our research and have every hope of improving both our observations of high altitude winds and predictions of fallout areas.

Mr. HOLIFIELD. Dr. Machta, we are very appreciative of your testimony, sir. If you have some other charts we would like you to just bring them up and explain them to us, because I see you have been there and the ones you have shown us are very interesting.

Dr. MACHTA. This is a picture (See Chart No. 6) of a typical high yield bomb cloud. The base of the mushroom head is 70,000 feet so the bulk of the volume of the nuclear cloud actually resides in the stratosphere.

(Chart No. 6 referred to appears on p. 622.)

CHART NO. 6—FALLOUT PATTERN FROM A TYPICAL HIGH-YIELD BOMB CLOUD



Dr. MACHTA. The division between the troposphere and the stratosphere in the case of the Pacific is at about 60,000 feet. It is our view that most of the radioactivity which actually falls out is in the mushroom head as opposed to the rather thin stem. The winds present in the case of the first shot are shown to the left, with the speeds shown as the numbers in miles per hour.

In the lowest level there are easterly winds which by 15,000 feet change to westerly winds and reach their maximum speed from the west at about 40,000 feet.

Then at the tropopause they change back to winds blowing toward the west and increase in speed up to 45 miles an hour at about 100,000 feet. These lines shown in the lower righthand corner of the figure are the isolines; lines of fallout intensities which resulted from the March 1 explosion. In this case, ground zero is hypothetically placed over Chicago, Ill.

The outer line which is 50 roentgens, effective biological dose, denotes a level of radioactivity at which some sort of countermeasure would have to be taken in order to avoid radiation hazards. The line labeled "100," which encloses Detroit, represents a dose which, if people were simply to stay outside, would produce some illness.

Mr. HOLIFIELD. You say "outside"; you mean out of doors?

Dr. MACHTA. Out of doors.

The line labeled "400" represents a dosage which, if no countermeasures were taken, would produce widespread deaths.

Mr. HOLIFIELD. That goes for how many miles?

Dr. MACHTA. A little under 200 miles.

Mr. HOLIFIELD. In other words, a downwind pattern of 200 miles for that size bomb would be lethal to everyone in that city, in that vicinity if they were not in shelter?

Dr. MACHTA. Yes. What I would like to show is what would happen.

Mr. HOLIFIELD. Let's go ahead and take those graduations before we leave this.

Dr. MACHTA. Yes.

Mr. HOLIFIELD. What happens? Is the next circle——

Dr. MACHTA. We have shown no additional circles. We have taken this information from a report from the AEC which has given only these three isolines.

Mr. HOLIFIELD. I know you have 50 roentgens. What distance is that?

Dr. MACHTA. The distance out, my guess would be about 400 statute miles.

Mr. HOLIFIELD. And of course 50 roentgens accumulated over several days at that rate would also be lethal.

Dr. MACHTA. No, sir. These numbers, 50 roentgens, represent accumulation over a long period of time. These are not dose rate but accumulated doses.

Mr. HOLIFIELD. Accumulation over what length of time?

Dr. MACHTA. About 30 days, more or less.

Mr. HOLIFIELD. But that would not apply to the 200-mile inside circle there, because your roentgens would be so high you would get your lethal dose in less than a day. You would probably get it in an hour wouldn't you?

Dr. MACHTA. Let's say 6 hours or something of that sort.

Mr. HOLIFIELD. I see.

Dr. MACHTA. What we are interested in showing is what kind of a pattern one would have gotten had we had a different wind field in this case.

Mr. RIEHLMAN. Before you leave that chart, I think I recall your saying in the stratosphere the bulk of the fallout still remains. You have an opposite direction of the wind, you have a wind blowing from the east to the west. What can we expect from the fallout of that great portion?

Dr. MACHTA. The particles which are originally in the upper part of the mushroom head would, as they descend, move westward, because the winds are blowing toward the west. However, as they fall down to the levels where the winds blow to the east, they would be carried eastward sufficiently so the ultimate point of deposition would lie to the east.

Mr. RIEHLMAN. That clarifies it.

Mr. BALWAN. The dangerous particles up there, the particles which pierce the troposphere, are they dangerous in the fallout?

Dr. MACHTA. Yes. It is our view that large particles, largely in the stratosphere initially break through the tropopause, and are deposited out on the ground.

Mr. BALWAN. Do we have any information on the percentage of particles that are in the head of the mushroom that come out through the tropopause? Or does 80 percent of that become part of the global fallout which takes 10 years?

Dr. MACHTA. I have the information, but I would like to have it checked for security by the AEC.

Mr. BALWAN. This was something Dr. Libby gave us. Where most of the particles in the head circulated in the global fallout and remained there for 10 years and are not dangerous.

Dr. MACHTA. Yes. All small particles which are in the stratosphere will remain there for a long time. All particles which are small and originate in the troposphere will be removed rather quickly by being rained out. This is the point I believe Dr. Libby is making.

Mr. HOLIFIELD. Is it not true that you have to know the surface composition, whether it is rock, sand, or dirt in order to know what you are faced with in the estimate of the size of the particles that do go into the mushroom?

Dr. MACHTA. Yes, sir; I believe you are correct.

Mr. HOLIFIELD. And we have no scientific data on the type of particles which would exist that would come from a large city like Chicago, because we did not have the detection instruments at Hiroshima and Nagasaki and those are the only cities that have been bombed that we had any record of.

Dr. MACHTA. There was very little fallout in the case of the attacks on Japan because they were air bursts. Consequently they would not have done any good anyway. There is some evidence that perhaps the type of soil or rock over which the explosion occurs may not be terribly important. But this evidence is not very strong.

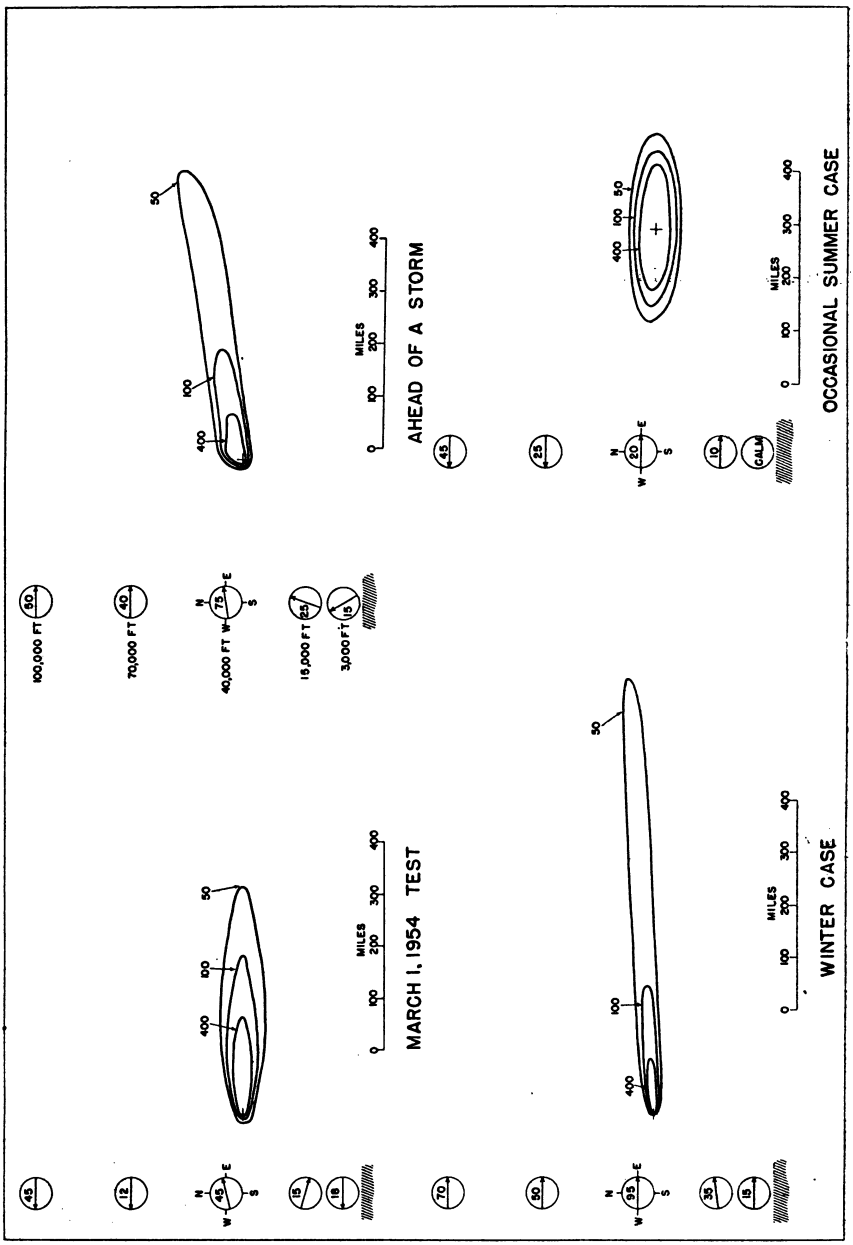
Mr. BALWAN. There is a difference of opinion on that too.

Dr. MACHTA. It is more an absence of information rather than opinions.

In the upper left hand portion of the next picture are a series of isodose lines which have been copied from the isoline on the previous figure. They are from the March 1 test in the Pacific and to the left are the winds. What I would like to illustrate is some of the kinds of patterns we would get with the winds we observe in the United States (see Chart No. 7).

(Chart No. 7 referred to follows:)

CHART NO. 7—HOW WINDS AND SEASONS AFFECT FALLOUT PATTERN



Dr. MACHTA. In the lower left is the kind of an isodose pattern one would get in the winter over the United States when we have west winds at almost all levels with quite high speeds especially in the region of a jet stream where the speeds might be over a hundred miles an hour in many cases. The pattern instead of being relatively wide and comparatively short like a cigar would be very elongated like a finger, narrow and long.

The upper right-hand picture shows the fallout pattern ahead of a storm where the lower level winds blow more or less from the south and change to westerly with higher altitudes. This is the point which the chairman made, namely, that winds at each altitude change.

In this case the fallout from the stem would lie to the north. The fallout from the mushroom head would lie to the east-northeast.

It is our view that since most of the radioactivity in the stem is attached to fairly large particles the fallout from the stem will be located relatively close to ground zero, and that the distant fallout will almost always originate at higher altitudes and be influenced by the winds at higher as well as lower altitudes.

The lower right-hand picture shows a pattern which one sometimes gets in the southern part of the United States when the winds are light. The winds change from west in the lower levels to fairly strong east winds in the upper levels and instead of getting a cigar with the ground zero at one of the points, the fallout can encircle the ground zero. There is no hope of evacuation in due-west or due-east direction.

Mr. HOLIFIELD. Your nearest point of emergence from the contaminated area would be the north and south?

Dr. MACHTA. And there are situations where this long portion could be oriented that way instead of east-west.

Would you care to see how we analyze the UF winds to obtain our fallout sectors?

Mr. HOLIFIELD. Yes, sir. We are on the receiving end of information. Any information you give us we would like to have.

Dr. MACHTA. The kind of information which is sent out on the teletypewriter is shown on the upper left (see chart No. 8).

(Chart No. 8 referred to appears on p. 627.)

Dr. MACHTA. TOE are the call letters for Topeka, Kans. This gobbledygook of numbers is translated into meaningful numbers by stating that the bearing of the fallout which originates at 5,000 feet above the ground would be 110 degrees or toward the east-southeast and that it would take the fallout 3 hours to reach 80 miles from ground zero.

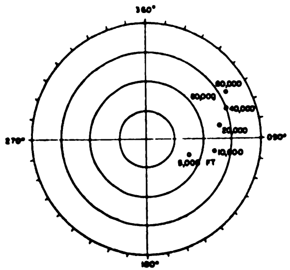
And so on for the other altitudes which might be the originating altitudes of fallout. These points are then plotted by the observer or the civil-defense official on a transparent overlay shown in the lower left, which can then be placed on his target as shown on the right-hand portion of the figure. The target here is selected as Kansas City. The points in Missouri are a copy of the points which were obtained from the left-hand side, derived directly from the message.

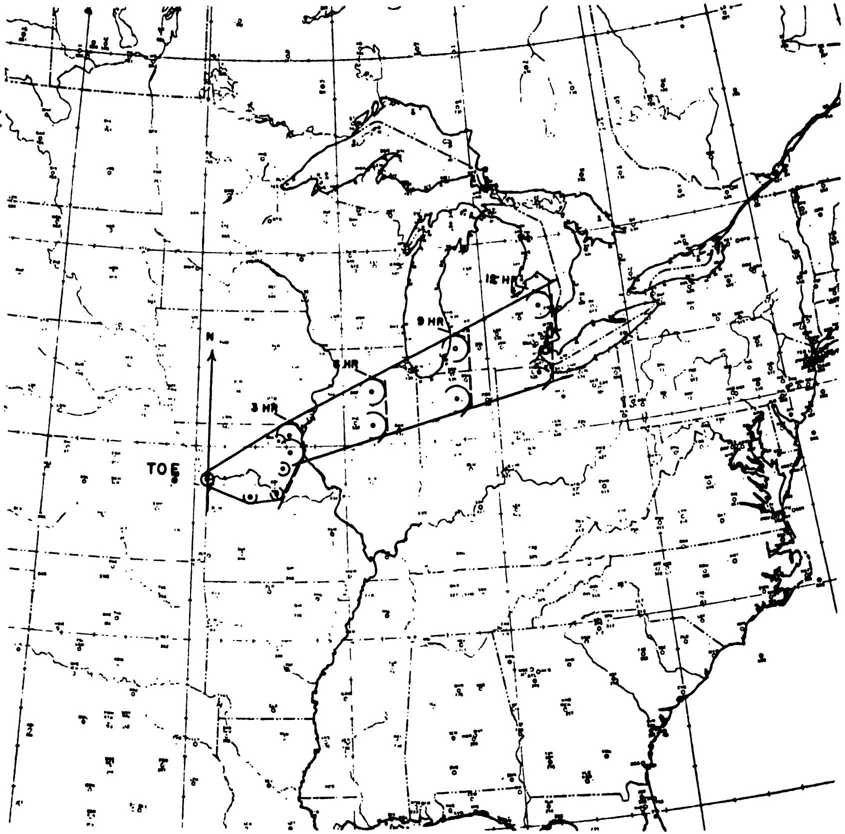
The width of the cloud is then added on to the likely sector into which fallout will occur. The stem fallout sector which is this portion due east of Kansas City is carried out for only 3 hours. One can then extrapolate from the distance of fallout in 3 hours by going twice

CHART NO. 8—DECODING AND PLOTTING A WEATHER BUREAU FALLOUT FORECAST MESSAGE

TOE 1108 11012 20813 40715 60616 80614

LEVEL	BEARING	3 hr FALLOUT DISTANCE
5,000 FT	110°	80 MILES
10,000	100°	120
20,000	080°	130
40,000	070°	150
60,000	060°	160
80,000	060°	140





72796—56—pt. 3——3

that distance to get the fallout in 6 hours and so on for 9 hours or 12 hours. One has therefore the following information from this message: the fallout will be in the east-northeasterly direction from ground zero. People in St. Louis will have at least 3 hours of warning time before the fallout will occur. People in Chicago would have at least 6 hours of warning time. We believe that the fallout from the lower portion of the stem which is the portion on the figure due east of Kansas City is not dangerous after 3 hours. So we do not extend the fallout which is going toward the east or east-southeast at a distance greater than 3 hours. It is only the fallout from the mushroom head which we view as being important far downwind.

Mr. HOLIFIELD. Did you compute that on the basis of any given strength bomb?

Dr. MACHTA. No, this is largely independent of the bomb. The only weapon information which went into this is the fact, that the cloud reached to 80,000 feet which would be true, as we agreed with any megaton yield weapon and that the cloud dimensions were such that the width of the mushroom head of the cloud is about 40 miles wide and that the stem is somewhere between 10 and 20 miles wide. We made no guess as to whether or not it is a 1- or 20-megaton bomb.

Mr. HOLIFIELD. The presence of heavy fog in the air or rain showers would have a very direct effect upon the concentration of fallout, would it not?

Dr. MACHTA. This is not quite as important in the case of megaton bombs, we feel, as in the case of kiloton bombs. Because the important close-in fallout particles originate above about 60,000 feet, whereas the rain clouds rarely originate above about 20,000 feet, the particles which fall from above 60,000 feet to 20,000 feet would fall with no assistance from raindrops so that it is only the last portion of their descent which might be affected. It is true that one will get locally higher concentrations but this will not be as significant as in the case of the kiloton bombs. In the case of the kiloton bombs of Nevada we never fire when it is raining near the proving grounds so we do not have experience as to what would happen.

Mr. HOLIFIELD. The reason we do not fire is that we do not want that concentration of radioactivity. But an enemy might want to take advantage of weather conditions which we avoid in all these tests.

Dr. MACHTA. That is true, sir.

I believe that is all the material that we have.

Mr. HOLIFIELD. Any questions?

Mr. BALWAN. I want to ask a question. Has all this information been provided to FCDA?

Dr. MACHTA. Yes, sir.

Mr. BALWAN. And how recently have you had most of this information and your theories on fallout directions?

Dr. MACHTA. We have provided the information to FCDA for use at the local level since 1st of June 1955.

Mr. BALWAN. How much money does the Weather Bureau have to devote to work for the FCDA?

Dr. MACHTA. May I defer these questions to Mr. Davis? I am the scientist on the program, not the administrator.

Mr. DAVIS. We are operating this year on a total budget of $175,000 for support to the FCDA, $75,000 of that item is the climatological

study that Dr. Machta has indicated here, the probability study. The $100,000 is basically for salaries for meteorologists who are assigned to the FCDA national and regional offices.

Mr. BALWAN. How much of the $175,000 is Commerce's own budget money?

Mr. DAVIS. None of it. This is transferred money, sir.

Mr. BALWAN. Is any of the work done on Commerce money alone?

Mr. DAVIS. I would answer that, I believe, by pointing out that Dr. Machta, for example, is spending some of his time on this project and he is not on FCDA funds, and at any time that we engage in conferences and research and problems over at the Weather Bureau it is necessary to occupy the time of people who are not being paid from FCDA sources.

Mr. BALWAN. You have people at the Weather Bureau who are putting some effort on FCDA problems but not necessarily reimbursed by FCDA.

Mr. DAVIS. That is correct and not necessarily full time of course.

Mr. BALWAN. What are the limitations on your work that are caused by the given number of dollars that you have from FCDA? I will put it this way, what else could you do that would be desirable to be done if you had more money?

Mr. DAVIS. We should be able to perform some more research, sir.

Mr. BALWAN. How about service?

Mr. DAVIS. We could place more meteorologists at the disposal of the FCDA people at their regional offices and at their national office, the sort of thing we are presently doing for them.

Mr. HOLIFIELD. What is the function of these men in the FCDA offices?

Mr. DAVIS. These men presently, Mr. Chairman, are performing three basic functions as I see it. They are doing considerable travel with FCDA officials attending State and local civil defense meetings and at these meetings they are explaining some of the material that Dr. Machta has presented this morning, where you get this UF data, how you plot it, what you can do with it, how often it is available and that sort of thing.

In addition they are serving as staff meteorologists to the FCDA people themselves for the natural disaster work that the FCDA is doing. Recently in January for example, Mr. Chairman, when the floods hit northern California the second time, fortunately we had a Weather Bureau meteorologist at the FCDA regional office at Santa Rosa, Calif., and through the assistance that this man was able to provide personally, the FCDA officials were able to get to the scene of the flood and do some of their responsible functions more satisfactorily and more adequately.

This the the sort of thing that these regional meteorologists, as we call them, are doing for FCDA.

Mr. HOLIFIELD. Do they also in these different locations evaluate this fallout information and furnish daily plots or do they leave that to some subordinate?

Mr. DAVIS. As a matter of fact, they do it themselves and they have trained others in these regional FCDA offices to be able to plot out and follow the same techniques.

Mr. HOLIFIELD. When they are absent?

Mr. DAVIS. Yes, sir.

Mr. HOLIFIELD. On speaking engagements or educational tours?

Mr. DAVIS. Yes. As a normal routine, they are briefing the FCDA officials on fallout, natural disasters, floods, and that sort of thing.

Mr. BALWAN. Dr. Machta stated you give twice daily predictions on the teletypewriter and that it might be desirable to have four a day.

Mr. DAVIS. Yes, sir.

Mr. BALWAN. What is the limitation? Why aren't you giving four a day? Have you been asked for four a day?

Mr. DAVIS. We have not, thus far. But four a day, sir, would represent a tremendous increase in cost, and in addition it would require time on the teletype circuits which simply isn't available today.

Mr. BALWAN. How much money will it take in relative values, twice the amount that you have for that service or three times the amount, or do you need new capital construction to put out this service?

Mr. DAVIS. Obviously, sir, I am not prepared to give a quick answer that would be satisfactory to you. I would think aloud sir, that in terms of our present station activities it would not require a doubling of costs because some of those costs continue whether we are taking 2 observations a day or 4 a day. I think we might find that the increase in our operating costs—and if you please, this is a quick opinion—would be of the order of one to two million dollars if we were to double the number of upper air reports that we are getting from these upper air stations in the United States. This dodges the question of how you get the extra reports transmitted on communication facilities.

This would involve faster teletypewriter equipment than we presently have. We understand that the Civil Aeronautics Administration which actually handles the circuits for us in the Department of Commerce has plans for increasing the speed of the network from 75 words per minute to 100 words.

Mr. BALWAN. The military departments have their own circuits to transmit the data on this?

Mr. DAVIS. Yes.

Mr. BALWAN. Could the use of their circuits be helpful in doubling the number of daily forecasts that you make?

Mr. DAVIS. I am not prepared to answer, sir.

Mr. RIEHLMAN. I have one question, Mr. Chairman. Mr. Davis, would you care to comment on how effective the program is that Federal Civil Defense has in respect to using this type of data and information?

Mr. DAVIS. I have only limited information. I shall be happy to share that with you. We have checked with our meteorologist who is assigned to the national headquarters of the FCDA in Battle Creek and he has no actual count, but he mentioned to us as recently as yesterday that he believed that as he looked back on the tremendous work they have done with State and local people attending meetings and learning about this data, that it would be very conservative to say that 500 communities in the United States today are familiar with this data, that they are obtaining it and that they have been developing a potential for using it. This figure is an estimate sir, because he has not made a tabulation.

Dr. Machta mentioned the State of California, where we have specific information of the transmission to 154 communities, I believe. I could supplement that by reference to the State of New York, where a similar plan is now in operation. Doubtless there are others that we are not yet familiar with in the Weather Bureau.

Mr. HOLIFIELD. That would be a matter that we could find out by inquiry at the local level.

Mr. DAVIS. Yes; the Weather Bureau I am sure could undertake a survey without too much difficulty to find out from its officials to whom they are supplying this data.

Mr. HOLIFIELD. It would be interesting to know whether this information is being actually used to plot a fallout pattern upon receipt, so that if an emergency should occur it would have current information plotted and ready to transmit to the operating bases or whether it is being received in a more or less informal way and not much attention being paid to it.

I suppose that would vary with the efficiency of the local organizational setups.

Mr. DAVIS. I should think so; yes.

Mr. HOLIFIELD. It would be interesting to know if you do have that information or can obtain it, to give this committee that information, without too much trouble, we would appreciate having it. Your nine regional men report to what extent they of their own knowledge know this is actually being used in local plans?

Mr. DAVIS. We would be happy to undertake to get some information like that for this committee.

Mr. HOLIFIELD. I notice in your dealings in relation to plan No. 5 of 1950 that you are supposed to prepare analyses of past data, conduct research, and develop techniques and capabilities leading to improved forecasts of radiological fallout patterns and I assume that you have done that and I want to ask you this question: When did you start giving this information to these local areas?

Mr. DAVIS. I believe that goes back to June 1 of 1955, Mr. Chairman. Since that time it has been available all over the United States.

Mr. HOLIFIELD. You are also supposed to make these probable fallout patterns for the target areas and, as I understand it, this is to be made after consultation with such data as you have back over a period of several years.

How many of these primary target areas have you furnished with radioactive fallout patterns for the complete year?

Mr. MORGAN. As to the Detroit area which you illustrated.

Dr. MACHTA. We furnished them to none of the cities as yet. We will have data enabling us to furnish them to every single target in the United States. But as yet we have not completed this study.

Mr. HOLIFIELD. When do you estimate they will be ready for these cities to use?

Dr. MACHTA. Well, we will have information on the likelihood of fallout if it should occur in the summertime ready by May 15. If the fallout should occur in fall, by June 15. The winter study will be finished between July 15 and August 1, and the spring study will be finished by September 1, 1956.

Mr. HOLIFIELD. You are safe in saying then that you will have this information this year to all of the principal target areas?

Dr. MACHTA. Yes, sir.

Mr. BALWAN. That is part of your climatological study?

Dr. MACHTA. Yes, sir.

Mr. RIEHLMAN. Getting back to my question then, of course, the committee must understand that a lot of the information on the charts that we have seen this morning, apparently are not in the hands of the local civil defense directors.

Dr. MACHTA. The probabilities study was indicated as being a hypothetical pattern of what we hope to show to people. It is not in the hands of anyone.

Mr. HOLIFIELD. In other words you are showing us what you are going to do by the end of this year, the type of patterns you are going to furnish these people.

Dr. MACHTA. Yes.

Mr. RIEHLMAN. We are not in a very good position to ask questions as to how effective this is and how well they are bringing that to the attention of the civilians in their areas, are we?

Dr. MACHTA. As far as the probabilities study is concerned the answer is "No." As far as the day-by-day operations, this is an operation that can be done.

Mr. HOLIFIELD. Will you clarify just what you mean by that? In other words you are giving them the information twice a day so that they can plot their own fallout patterns?

Dr. MACHTA. Yes.

Mr. HOLIFIELD. But you are not giving them the historical backgrounds which would enable them to ascertain in advance the probability of a type of pattern that might occur at a certain time.

Dr. MACHTA. That is the correct interpretation.

Mr. MORGAN. Mr. Davis, has the FCDA consulted any of your men in the regional offices prior to their dispersal or evacuation planning?

In other words are they making use of the information that is available to them now in their planning, I mean evacuation and dispersal plans.

Mr. DAVIS. I don't have the information to answer that question, sir.

Mr. HOLIFIELD. Are there any further questions of these gentlemen?

Mr. ROBACK. I would like to ask a question, Mr. Chairman. First I would like to ask Mr. Davis, are you operating under thre delegations from the FCDA?

Mr. DAVIS. It is delegation No. 3 as I recall it.

Mr. ROBACK. Do you have three delegations which are in effect or does one supersede another?

Mr. DAVIS. No; I don't know of anything superseding anything else. There are two parts in the delegation and I have a copy of them here.

Mr. ROBACK. I would like to request, Mr. Chairman, that all of the delegated authority, that the Weather Bureau operates under, its terms of reference, be submitted for the record and join to that a brief statement the extent to which the delegation has been complied with and the reasons if any why the delegation has not been complied with.

Mr. DAVIS. Yes, sir.

Mr. HOLIFIELD. If it happens to be lack of funds or whatever the cause may be—thank you very much.

If you will submit that to the staff, we will be glad to have it for our records.

(The material referred to follows:)

STATEMENT CONCERNING CIVIL DEFENSE RESPONSIBILITIES DELEGATED TO THE UNITED STATES WEATHER BUREAU

Effective August 13, 1955, the following-described responsibilities were delegated to the Secretary of Commerce, who in turn redelegated them to the Weather Bureau:

"Prepare analysis of past data, conduct research, and develop techniques and capabilities leading to improved forecasts of radiological fallout patterns.

"Prepare and issue currently, as well as in an emergency, forecasts and estimates of areas likely to be covered by fallout as a result of enemy attack. Such information is to be made available to Federal, State, and local civil-defense authorities for public information."

This delegation of authority served to formalize responsibilities which the Weather Bureau had gradually assumed, in its dealings with civil-defense authorities, since the potential dangers of radioactive fallout first became known.

Special studies on the transport of atomic debris in the atmosphere were conducted and published in 1954 and 1955, before responsibilities for the studies had been formally delegated to the Weather Bureau. One study entitled "Winds and Fallout: A Climatological Appraisal," was published in June 1955 and was distributed widely by the Federal Civil Defense Adminstration. Similar studies are currently underway. One of them, which has been described in our statement to the subcommittee on March 13, 1956, is a climatological study of 5 years of daily upper wind data, from which probabilities of fallout, on a geographical basis, may be determined, and the average number of hours after the bomb drop before the fallout would begin.

Other areas of reasearch include the development and use of electronic computers to predict areas of expected fallout, and radioactive dosages. The Weather Bureau is conducting research with a high-speed electronic digital computer to improve its forecasts of fallout areas. In addition, it has provided direction for the National Bureau of Standards in the development of an electronic analogue fallout computer, which it hopes will eventually become available to active civil-defense communities. The Weather Bureau is also conducting research for the Atomic Energy Commission and the Department of Defense on dosage estimates which is currently applicable to civil-defense needs.

Current forecasts of areas likely to be covered by fallout as a result of enemy attack have been prepared twice daily since June 1, 1955, at numerous Weather Bureau stations in the United States. The program began with a 34-station network which was enlarged on February 1, 1956, to 52 stations. The forecasts are tarnsmitted by teletypewriter circuit throughout the entire country. There are over 500 drops on this circuit, thereby insuring wide distribution of the forecasts. Weather Bureau officials have contacted local and State civil-defense agencies in their areas, and have advised them of the availability of the forecasts, how they are to be used, and the like. In addition, some State civil-defense agencies are retransmitting the fallout forecasts on their own State communication facilities. To further the distribution and use of these forecasts, the Weather Bureau has assigned nine experienced professional meteorologists to the national and regional offices of the Federal Civil Defense Administration. These men travel in the various FCDA regions where they address local and State civil-defense groups on fallout problems, assist them in learning how and where to obtain the forecasts, and how to use them.

In its efforts to provide forecasts of fallout areas, the Weather Bureau has recognized that fallout resulting from detonation of nuclear bombs over Canadian targets might fall on United States soil and constitute a real hazard. Accordingly, plans for Canadian participation in the fallout forecasting program have been worked out and agreed to by the meteorological services of the two countries. These Canadian forecasts will be transmitted by the same teletypewriter circuit which carries the forecasts from United States locations, and will be

available throughout the United States at all of the more than 500 locations having drops on the circuit. The new program will get underway just as soon as the Canadian Meteorological Division can get out final operating instructions to its stations which are to participate.

Fallout forecasts are also prepared by the Weather Bureau in the Territory of Hawaii and will be available in Alaska by no later than April 1, 1956.

(The preceding statement was prepared by Dr. Lester Machta, Chief, Special Projects Section, and J. J. Davis, Civil Defense Coordinator, United States Weather Bureau, Washington 25, D. C., as requested by the Military Operations Subcommittee of the Committee on Government Operations on March 13, 1956.)

Mr. HOLIFIELD. Are there any further questions?

If not, we will thank you gentlemen again for your very fine testimony and we appreciate the time that you have given us and excuse you at this time.

Our next witness is Mr. C. D. Curtiss, Commissioner of the Bureau of Public Roads; Mr. Curtiss, if you will take the witness stand and any of your assistants which you wish to have by your side during this presentation for any reason why you may also invite them to come forward.

You have a prepared statement I see, Mr. Curtiss. Would you like to proceed with it?

STATEMENT OF C. D. CURTISS, COMMISSIONER, BUREAU OF PUBLIC ROADS; ACCOMPANIED BY FRED E. SCHNEPFE, ASSISTANT TO THE COMMISSIONER, BUREAU OF PUBLIC ROADS; AND P. A. CARMICHAEL, CHIEF, CIVIL DEFENSE PROGRAM, ASSISTANCE BRANCH, BUREAU OF PUBLIC ROADS

Mr. CURTISS. Pursuant to the authority contained in section 201 (b) of the Federal Civil Defense Act of 1950, the Administrator of the Federal Civil Defense Administration, with the approval of the President, delegated to the Secretary of Commerce certain authority and responsibility for assisting in accomplishing the objectives included in the act.

The following four items under FCDA delegation No. 2 were redelegated by the Secretary to the Bureau of Public Roads:

1. Provide advice and guidance to State highway departments in the designation of State civil-defense emergency highway routes.

2. Coordinate interstate and State designated civil-defense highway systems to assure uniformity of designation for civil-defense emergency purposes.

3. Plan a national program, develop technical guidance for States, and direct Federal activities concerning emergency clearance and restoration of highways, streets, and bridges in damaged areas.

4. Provide technical guidance to States concerning highway traffic-control problems which may be created during a civil-defense emergency.

A further description and clarification of the responsibilities of Public Roads under delegation No. 2 are contained in a memorandum of understanding between FCDA and Public Roads. Following are certain excerpts from that memorandum setting forth the objectives of the program contemplated under the delegation.

1. Provide technical guidance oncerning evacuation planning and highway traffic regulation and supervision problems which may be

officials to the end that the public will not again become uncertain and confused because of widely different and contradictory opinions.

4. The Federal Civil Defense Administration receive prompt and complete information on improvements in weapons technology and changes in the international situation or the Military Establishment which affect the civil-defense program. On the basis of such information, the Federal Civil Defense Administration should promulgate promptly the changes that thus need to be made in their policies and programs. The ideal would be for the Federal Civil Defense Administration to announce changes in their programs simultaneously with the release of information by the Department of Defense, the Atomic Energy Commission, or the National Security Council on weapons improvements and other changes in the Military Establishment or in the international situation.

EXHIBIT 1

[New York Times, June 12, 1955]

CHEAPER H-BOMB IS NOW POSSIBLE—SIZE OF WEAPON VIRTUALLY LIMITLESS, AEC INDICATES—FALLOUT PERILS BARED

By Anthony Leviero

WASHINGTON, June 11.—The Atomic Energy Commission has officially indicated that the thermonuclear or hydrogen bomb can be made with the cheapest atomic explosives and in virtually limitless size.

The Commission has also indicated that lethal or damaging doses of radioactive fallout may persist for a long time.

Both significant points were contained in a speech by Dr. Willard F. Libby, member of the Commission. The speech received scant notice when Dr. Libby delivered it at a University of Chicago alumni reunion June 3 in Chicago.

It was couched in highly technical terms. For atomic scientists who are analyzing his paper, however, it was the beginning of frankness about fallout.

The nature, scope, and duration of fallout are questions of the utmost concern to civil-defense workers, who are seeking practicable data as the basis of policy on shelter and evacuation. The questions have remained in official obscurity, and consequently in dispute.

Atomic scientists here regard the Libby speech as basic confirmation of deductions that have been published since data became available on the hydrogen bomb test in the Pacific March 1, 1954.

The principal official data has come from Japanese analyses of the effect of fallout from this weapon on the crew of the *Fortunate Dragon*, a fishing boat, and from the report issued by Lewis L. Strauss, Commission Chairman, last February. The Strauss report disclosed that the explosion had spread lethal fallout over an area of 7,000 square miles, about the size of New Jersey.

Dr. Libby also discussed strontium-90, a tumor-causing radioactive product of nuclear explosions. He said atomic tests had not appreciably increased the general background level of this element, which last 30 years, but it would be a hazard in an atomic war.

The chief significance of Dr. Libby's speech was his reference to a nuclear explosion capable of releasing "10 megatons of fission energy." The key word is "fission." The ordinary atomic bomb releases energy by fissioning or splitting atoms. The thermonuclear weapon does this by "fusion" of hydrogen atoms.

Ordinary atomic bombs are placed in the kiloton category, and thermonuclear weapons in the megaton class. A kiloton is equivalent to 1,000 tons of TNT; a megaton to 1 million tons.

Dr. Libby referred to a 10-million-ton weapon that released energy by fission rather than fusion. This indicated that ordinary, cheap uranium 238 was the major explosive content and was responsible for fallout over a vast area.

SUPERWEAPONS POSSIBLE

The significance of this is held to be enormous. To physicists it means that Russia or any other country able to make ordinary atomic bombs can, with a little more effort, create superweapons of the megaton class. The great complications and expense hitherto associated with the manufacture of the thermonuclear bomb thus become negligible.

Moreover, this cheaper weapon is tremendously more deadly than a pure hydrogen bomb. The product of fusing hydrogen in the hydrogen bomb is stable helium, which is not radioactive. Such a weapon would produce only a little radioactivity from its common atomic bomb trigger.

Hence, the destructiveness of a hydrogen bomb is produced by heat and blast. By adding ordinary uranium to this weapon, the additional lethal radioactivity it created.

The scientific community now sees in Dr. Libby's speech the confirmation of their speculations and deductions, and especially those of Dr. J. Rotblat, British physicist, and Dr. Ralph E. Lapp, American atomic physicist.

In last month's issue of the Bulletin of the Atomic Scientists, Dr. Rotblat concluded that "fissions accounts for most of the energy released in the hydrogen bomb." He said that if his deductions were correct, "the so-called hydrogen bomb is in reality a fission-fusion-fission bomb."

This means that expensive uranium 235 is employed as a trigger to create the extremely high temperature needed to cause the hydrogen fusion process. Fusion creates a great flow of neutrons into a jacket of cheap uranium 238 that is "fissioned," liberating radioactive fragments.

"The potential destruction which may be wrought by this radioactivity in the fallout of a surface detonation is dealt with in the AEC report (of February), which shows that the area of lethal damage may be 25 times greater than that from the blast and heat effects," Dr. Rotblat said.

The nonofficial scientific world might not have learned that the United States had achieved a weapon vastly more powerful than a pure hydrogen bomb but for the fallout that sickened the Japanese crew 120 miles from the explosion site.

CONCLUSIONS ARE DRAWN

Scientists draw these conclusions from the Libby speech:

The superweapon is cheap.

The 10-megaton weapon mentioned as an example by Dr. Libby is merely nominal. The weapon can be made in any size because of its comparative simplicity and the cheapness of uranium 238.

The fallout persists for days, weeks or months.

In addition to its direct or external radiation effects, the weapon creates toxic products like strontium 90 and radioactive iodine in large quantities, which are internally damaging.

Dr. Libby, in his discussion of fallout and a 10-megaton "fission" weapon, did not relate these to the hydrogen bomb that was tested in the Pacific March 1, 1954. According to congressional sources, that weapon was 14 to 16 megatons.

Instead, he talked of a fallout over a 100,000-square-mile area, which scientists regard as theoretical. They assume he did this for security reasons.

The 10-megaton bomb would produce an initial dosage rate of 67 roentgens a day, Dr. Libby said. A roentgen is a unit for relating fallout dosage in X-ray exposure. The theory is that half of the persons exposed to 400 roentgens over a short period would die, while the rest would get seriously sick. Radioactivity is also cumulative.

"In other words," Dr. Libby said, "a residence or exposure time of a few days in such an area could be dangerous. Of course, realizing that the disintegration rate decreases rapidly in time, we might well say that a matter of several days would be available for evacuation, or more importantly for decontamination of the inhabited parts of the area.

"An area of 100,000 square miles is so large that evacuation may be a bit impractical. One should remember that the contamination material is a light dust which, of course, will settle extremely gently on the surface of the earth and should be easily dislodged and removed. One envisages all sorts of devices and methods so that at a contamination of 67 roentgen per day dosage rate, one ought really to be able to do very considerable in decontaminating an area.

"Of course, if this same amount of radioactivity had been precipitated over a 10 times smaller area, there would have been no hope of decontamination until the material had cooled about tenfold. But it is always true that in regions of heavy fallout, such as these two, decontamination and protective measures must follow.

"In a period of waiting for cooling to occur to a level where decontamination is possible, there is only a choice between staying indoors in shelters and shielded evacuation in shielded cars or by helicopter. Under no condition in such areas should people remain resident without shelter or decontamination."

Scientists and others concerned with the problems of civil defense dispute such a statement, or at least the official attitude it indicates. Civil-defense officials still lack practical data on fallout. If Dr. Libby had related his discussion to the 7,000-square-mile area actually polluted in the test on March 1, 1954, the data could then be applied to problems of shelter and evacuation.

Scientists note that the fallout dose that Dr. Libby used for his theoretical 10,000-square-mile area would be many times more lethal in the much smaller area that would be polluted by a 10-megaton bomb.

REFERS TO TOLERANCE LIMITS

Still using his 100,000-square-mile area, Dr. Libby said that observers with detection instruments should set reasonable tolerance limits, such as 10 roentgens, although on the day of explosion the dose would be 67 roentgens. He said this meant that persons would have to stay indoors the first day, most of the time in shelters, so as not to "run into pockets of radioactivity."

"After a week," he added, "the permissible exposure time will be 10 times longer and the radiation rate will have been reduced to about 6.7 roentgens per day, so that it will be possible to spend several hours outside."

However, Dr. Lapp has said that if the realistic 7,000-square-mile area were used, the dose would be 95 roentgens a day after the first week. It would be 2 months before it decayed to 6.7 roentgens, at which time, as Dr. Libby noted, "it will be possible to spend several hours outside."

Scientists also raise questions about strontium-90, which is hazardous because it has a life of 30 years and because it is similar to calcium, has an affinity for bones and is "a potential source of bone tumor." Dr. Libby said this element was produced by about 2½ percent of "all of the fission explosions or fission acts."

Dr. Libby said:

"It is clear, of course, that ingenious devices such as street sweepers, in which the driver sits on a bag of sand or a thick metal slab to protect him from radiation, could be used with great effectiveness. It is also clear that crews could operate with street-cleaning and fire-fighting machinery to decontaminate cities.

"In the countryside such devices as plowing fields might be most effective. The natural weathering processes which occur in the open probably are extremely effective in reducing the contamination level. In fact, just the blowing of the winds and the movement of dust and soil will help cover up the material."

72796—56—pt. 3——9

CHART I—SURVIVAL DATA: 20 MEGATON TN BOMB PRIMARY EFFECTS, PRACTICAL LIMIT SHELTERS (CONCRETE ROOF PLUS 2-FOOT EARTH SHIELD)

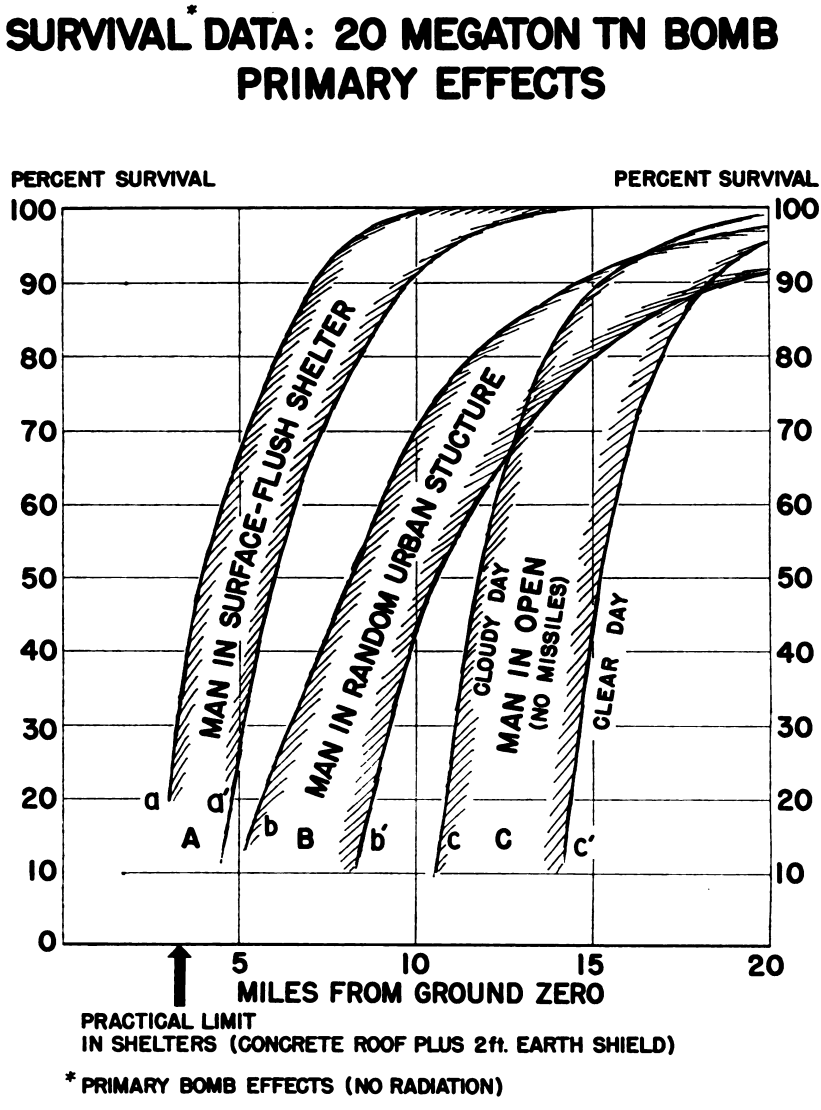
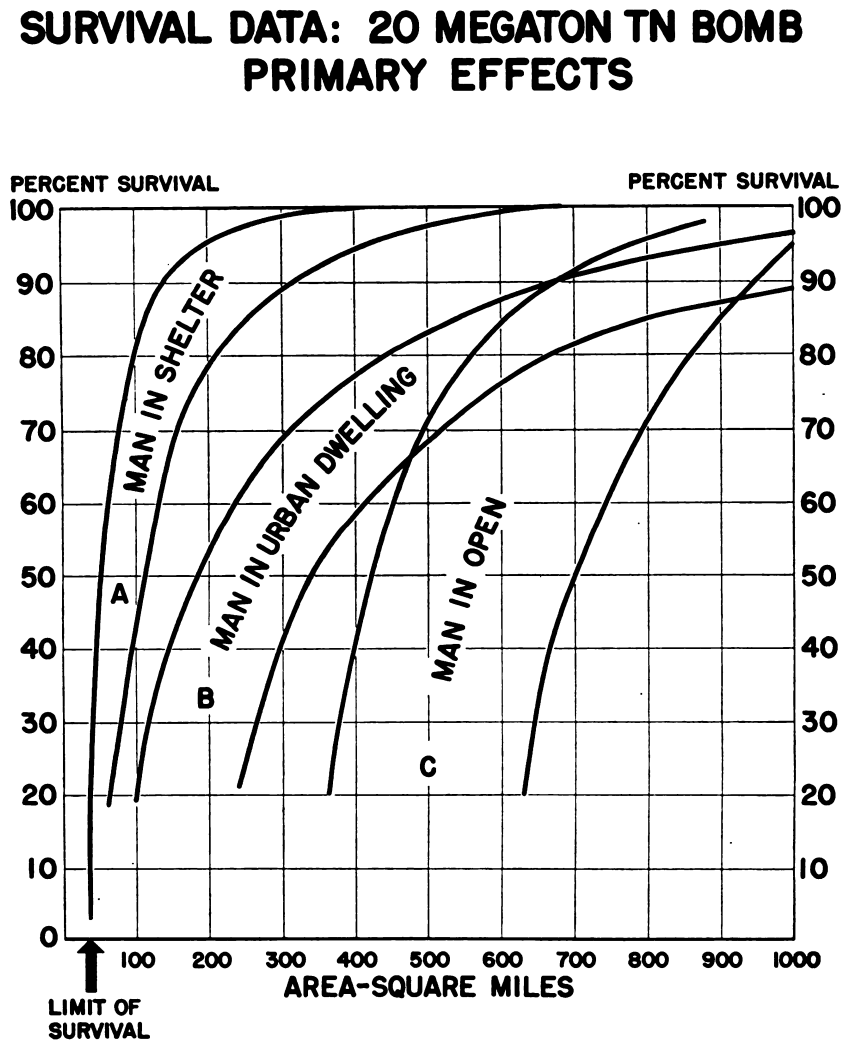


CHART II—SURVIVAL DATA: 20 MEGATON TN BOMB PRIMARY EFFECTS, LIMIT OF SURVIVAL



Dr. LAPP. Let me answer the question in this way: I would say that, theoretically, the answer to that would be, "Yes, you could increase that." But it is a question as to the time persistence of the hazard that you want to make. If you used a material which was activated very easily, such as sodium or something like that, you can get a very high radioactivity, but it dies off very quickly. So that you have to consider what the problem really at hand is in terms of denying territory.

In my own opinion, I think what may be under discussion here is a cobalt bomb, and the concept here is that you take an H-bomb and around the H-bomb you put a mantle of the metal cobalt. The cobalt would then be activated by the outward flash of neutrons, which convert ordinary cobalt into cobalt 60, which is radioactive cobalt with a half life of 5.3 years.

This has been widely popularized. In fact, I can tell you of my own personal experience in giving lectures around the country and getting questions after a lecture, that the cobalt bomb is assumed as a stockpiled item in our arsenal. The United States, to my knowledge, has never made a statement on the cobalt bomb. I believe it would be worth while to make a statement.

Let me say that, in my opinion, a cobalt bomb could not compare in its lethality, so far as radioactivity is concerned, with a superbomb in which that outer mantle is not cobalt but uranium.

The reason for that is—it is a technical one. When you take a uranium atom——

Mr. HOLIFIELD. You are talking—when you say an outer cover of uranium, you are talking about ordinary uranium metal?

Dr. LAPP. I would be talking about ordinary uranium metal or any combination of that uranium with any degree of enrichment, you might say, of that. I wouldn't rule out the possibility of it being not pure uranium. But I think in terms of a rough answer to your question, one could say, "Yes."

Let me explain just a point of technology, which is a pretty puzzling one to get across to anyone who does not know nuclear physics.

When you split a uranium atom in 2, it is rather perverse; it does not split into precisely 2 equal parts. One would think it would, and this has been one of the fundamental problems of physics, to solve why it does not.

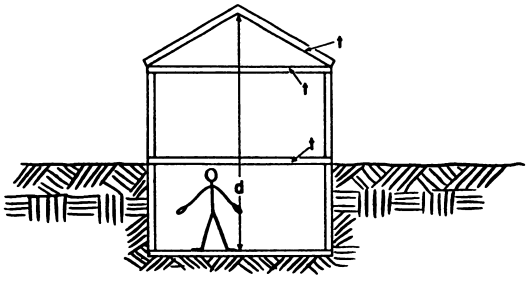
But when you split a uranium atom in two, it prefers to split into a number of different things, a heavy part and a light part. If you take a single atom of uranium and split it right in two, that particular atom might split into, let's say, barium and krypton, barium being that element which is present in that milkshake you taken when you have an X-ray series, and krypton being a noble gas.

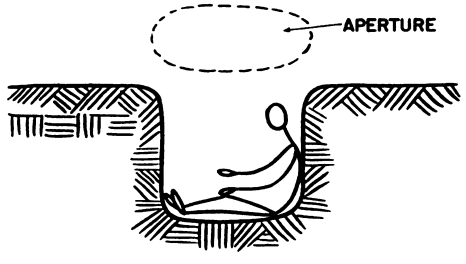
But in addition, if you take not—well, let's take a thing this big [holding a paper cup]. This would correspond to about 1 kilogram of uranium, if this were solid uranium.

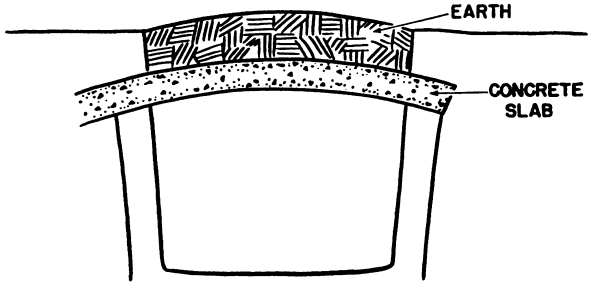
Supposing we took that solid uranium and completely fissioned it, so that every single atom split in two; and then supposing we had some kind of a miraculous experiment here so that we could collect all the split atoms, obviously if it were a bomb explosion, that stuff would fly apart. But if we could manage to collect it and bring it all back into 1 piece again, we would have not quite a kilogram of this

CHART IV—FALLOUT: SHIELDING CONSIDERATIONS

FALL-OUT: SHIELDING CONSIDERATIONS







3-page list of these civil effects test group studies and programs as a reference document in the record.

Mr. BOWMAN. Is this for Operation Teapot?

Mr. HOLIFIELD. This is entitled "1955 Test Series, R. L. Corsbie, Director."

Mr. BOWMAN. I gave another list of the 1953 series this morning which I also would like to have included.

Mr. HOLIFIELD. Without objection, that will also be included in the appendix of the record.

(The documents referred to are as follows:)

Civil effects test group—1955 test series

Program and project numbers	Program and project titles	Program director and project officers	Sponsor and performing agency
Program 30	Evaluation and documentation of radiological contamination.	R. W. Johnston, Director.	AEC.
Project 30.1	Automatic measurement and recording of radiation levels.	H. D. LeVine	NYOO/HASL.
Project 30.2	Utilization of telemetering techniques in evaluating residual radioactive contamination.	R. W. Johnston	BM.
Project 30.3	Development and evaluation of aerial survey techniques for fallout surface contamination.	H. D. LeVine	NYOO/HASL.
Program 31	Response of residential, commercial, industrial structures, and materials to nuclear effects.	B. C Taylor, Director	FCDA/AEC.
Project 31.1	Damage to conventional and special types of residences exposed to nuclear effects.	P. A. Randall	HHFA/FCDA.
Project 31.2	Damage to commercial institutional, and industrial structures and contents exposed to nuclear effects.	Bruce G. Johnston	FCDA.
Project 31.3	Deleted		
Project 31.4	Comparison slab test	Walton Clark	PBS/FCDA.
Project 31.5	Thermal ignition and response of materials.	K. Laughlin	FCDA.
Project 31.6	Methods of determining yields and location of nuclear explosions.	W. Bascom	FCDA/AEC.
Program 32	Exposure of foods and foodstuffs to nuclear explosions.	E. P. Laug, Director	FCDA.
Project 32.1	The effects on bulk staples	S. C. Rowe	FCDA/FDA.
Project 32.2	The effects on canned foods	C. Greenleaf	FCDA/FDA.
Project 32.3	The effects on meat and meat products.	R. H. Philbeck	FCDA/DA.
Project 32.4	The effects on semiperishable foods and packaging.	R. E. Hardenburg	FCDA/DA.
Project 32.5	The effects on frozen foods	H. P. Schmitt	FCDA/FDA.
Program 33	Biological and medical investigations	C. S. White, Director	AEC/FCDA.
Project 33.1	Effects of overpressures on biological systems.	T. L. Chiffelle	BM/Lovelace.
Project 33.2	The effects of noise in blast resistant shelters.	F. C. Hirsch	FCDA/BM/SL.
Project 33.3	Deleted		
Project 33.4	Distribution and density of missiles from nuclear explosions.	I. G. Bowen	BM/FCDA/Lovelace.
Program 34	Shelters for civil populations	L. J. Vortman, Director.	FCDA/AEC.
Project 34.1a	Evaluation of indoor home shelters exposed to nuclear effects.	H. Birnbaum	FCDA.
Project 34.1b	Evaluation of outdoor family shelters exposed to nuclear effects.	do	FCDA.
Project 34.2	Investigation of rise time and duration of pressures in certain regions.	R. S. Millican	BM/SL.
Project 34.3	Structural behavior of group shelters under various blast loadings.	H. Birnbaum	FCDA.
Project 34.4	Nuclear effects on machine tools	L. Sparks	AEC/SFO.
Program 35	Utilities, services, and associated equipment exposed to nuclear explosion.	A. Stevenson, Director	FCDA/AEC.
Project 35.1	Electric utilities	R. V. H. Wood	FCDA/AEC.
Project 35.2	Communications equipment	R. H. Williamson	FCDA/AEC.
Project 35.3	Deleted		
Project 35.4	Industrial and domestic gas storage and distribution:		
	(a) Liquid petroleum gas	P. W. Tucker, G. Corfield.	FCDA.
	(b) Natural and manufactured gas		FCDA
Project 35.5	Record storage equipment and facilities.	R. Bascom	FCDA/AEC.

Civil effects test group—1955 test series—Continued

Program and project numbers	Program and project titles	Program director and project officers	Sponsor and performing agency
Program 36	Mobile housing and emergency vehicles	J. C. Green, Director	FCDA.
Project 36.1	Utilization of trailer coach mobile homes following exposure to nuclear effects.	Ebe R. Shaw	FCDA.
Project 36.2	Operational use of civil-defense emergency vehicles.	F. McNea	FCDA.
Program 37	Fallout studies	K. H. Larson, Director	AEC.
Project 37.1	The factors influencing the biological fate and persistence of radioactive fallout.	R. G. Lindberg	BM/UCLA.
Project 37.2	The phenomenology of fallout at near distance.	L. Baurmash	BM/UCLA.
Project 37.3	Evaluation of inhalation exposures in rabbits.	G. V. Taplin	BM/UCLA.
Project 37.4	Deleted		
Program 38	Civil defense radef studies	R. Goeke, Director	FCDA.
Project 38.1	Civil defense monitoring techniques	F. Rehm	FCDA.
Project 38.2	Indoctrination and training of radef personnel.	R. Goeke	FCDA.
Project 38.3	Evaluation of civil defense radef instruments.	J. H. Tolan	FCDA.
Project 38.4	Comparative intensities of gamma radiation in various portions of structures under area.	F. Rehm	FCDA.
Project 38.5	Offsite radiological training exercise	C. T. Rainey	FCDA/C.
Program 39	Program instrumentation and photography.	R. L. Corsbie, Director.	AEC/FCDA
Project 39.1	Gamma and neutron radiation measurements.	L. J. Deal	BM/FCDA/EGG.
Project 39.2	Static and dynamic overpressure measurements.	R. S. Millican	BM/FCDA/SL.
Project 39.3	Thermal radiation measurements	B. O'Keefe	BM/FCDA/EGG.
Project 39.4	Technical photography:		
	(*a*) Documentary	S. A. Anthony	BM/LASL.
	(*b*) High-speed—blast biology	M. Palmer	BM/L'lace.
	(*c*) High-speed—physical phenomena.	B. O'Keefe	FCDA/EGG.
	(*d*) General and motion picture	O. D. King, Jr	FCDA.
Project 39.5	Measurement and permanent recording of fast neutrons by effects on semiconductors.	B. Cassen	BM/LASL/UCLA.
Project 39.6	Measurement of initial and residual radiation by chemical methods.	G. V. Taplin	BM/UCLA.
Project 39.7	Physical dosimetry of neutrons and gamma rays in terms of rep.	Wright Langham	BM/LASL/OR.

NOTE.—Prepared by: R. L. Corsbie, Director, Civil Effects Test Group, Sept. 27, 1954. Revised Jan. 24, 1955. 2d revision Mar. 28, 1955.

Schedule of reports for civil effects tests Upshot-Knothole

Project	Title	Author	Agency
21.1	Basement and Backyard Home Shelters	Joseph Byrnes	AEC–FCDA.
21.2	Blast Effects on Dwelling Units	do	FCDA.
21.3	Air-Zero Locators	B. C. Taylor	FCDA.
22.1	Evaluation of Radef Survey Methods	V. B. Lamoureux	FCDA.
22.2	Evaluation of Radef Instruments	J. C. Greene	FCDA.
22.3	Radiological Hazards in Civil Defense	V. B. Lamoureux	FCDA.
22.4	Drug Irradiation Studies	E. P. Laug	FDA.
23.1	Biological Effectiveness of Ionizing Radiation within Shelters.	V. P. Bond	NRDL.
23.2	Bacteriological Studies on Dogs Exposed to Primarily Neutron Irradiation in Shelters.	M. S. Silverman	NRDL.
23.3	Long-Term Studies on Dogs Exposed to Primarily Neutron Irradiation in Shelters.	V. P. Bond	NRDL.
23.4	Effects of Neutron Irradiation on Sex-linked Lethal Mutation in *Drosophilidae*.	P. T. Ives	Amherst.
23.5	Effects of Neutrons on Spores of Smuts and Rusts	E. C. Stakman	University of Minnesota.
23.6	Mutations at Specific Loci in *Drosophila* Exposed to Neutrons.	G. H. Mickey, W. K. Baker	LRNL
23.7	Chromosome Breaks in *Drosophila* Exposed to Neutrons	G. W. Beadle	Cal. Tech.
23.8	Lethal Neutron Dose for *Drosophila:* First Generation Lethality.	J. W. Gowen	Iowa State.
23.9	Neutron Dosage/Mutation Curve for Color Mutations in Wasp *Mormoniella*.	P. W. Whiting	University of Pennsylvania.
23.10	Effects of Neutrons on Chromosome Breaks in *Tradescantia*	J. Kirby-Smith	ORNL.
23.11	Chromosome Breaks and Mutations in *Datura* Exposed to Neutrons.	A. F. Blakeslee	Smith.
23.12	Reverse Mutations in *Neurospora* Exposed to Neutrons	K. C. Atwood	ORNL.
23.13	Dominant Lethality and Sterility in Male Mice Exposed to Neutrons.	William Russell	ORNL.
23.14	Lethal Dose and First Generation Lethality in Two Strains of Mice.	J. W. Gowen	Iowa State.
23.15	Effects of Overpressure, Displacement, and Missiles on Animals and Dummies in Shelters.	J. E. Roberts, J. Clark	Lovelace.
23.16	Chromosome Breaks in Neutron-irradiated Maize Seeds	Drew Schwartz	ORNL.
23.17	Dosimetry for Biological Experiments to be Conducted in Conjunction with AEC Shelter Testing.	E. Tochilin	NRDL.
24.1	Evaluation of Communal Shelters	R. L. Corsbie	AEC.
24.2	Physical Measurements of Gamma and Neutron Radiation in Shelter and Instrumentation Evaluation.	L. J. Deal	AEC.
24.3	AEC Shelter Instrumentation	A. R. Soffel	Vitro.
26.1, 26.2	Physical, Mechanical, and Irradiation Evaluation of Civilian Vehicles Exposed to Atomic Attack.	S. A. Anthony, F. J. Perella, J. S. Jenner	AEC-FCDA.
27.1	Study of Off-Site Air-Borne Radioactive Materials, Nevada Proving Grounds. Gamma Fall-Out Originating from Upshot 2, 3, 4, 5, 7, and 8 at Various Distances up to 100 Miles From Ground Zero.	K. H. Larson	AEP/UCLA.
27.2	Radio-Ecological Observations on Components of the Biological Cycle as Influenced by Radioactive Contamination: Gamma Effects of Fall-Out on Selected Areas Contaminated by the Upshot Knothole Series.	R. G. Lindberg	AEP/UCLA.
28.1	Test of a Radiation Telemetering System	R. W. Johnston, F. C. Legler	AEC.
29.1	Comparison and Evaluation of Gamma Radiation Dosimetry Methods.	G. V. Taplin	UCLA.
29.2	Measurement of Fast Neutrons by Effects on Semi-Conductors.	Benedict Cassen	UCLA.
29.3	Evaluation of Dosimetry for Civil Effects Programs	R. L. Butenhoff	AEC.
29.4	Effective Energy of Residual Gamma Radiation	A. H. Dahl	University of Rochester.

Mr. FASCELL. I have this one question, Mr. Chairman. Mr. Bowman, do you know of any study that would give this committee information on how long it would take to prepare a reasonable protective shelter program for all of the target areas in this country?

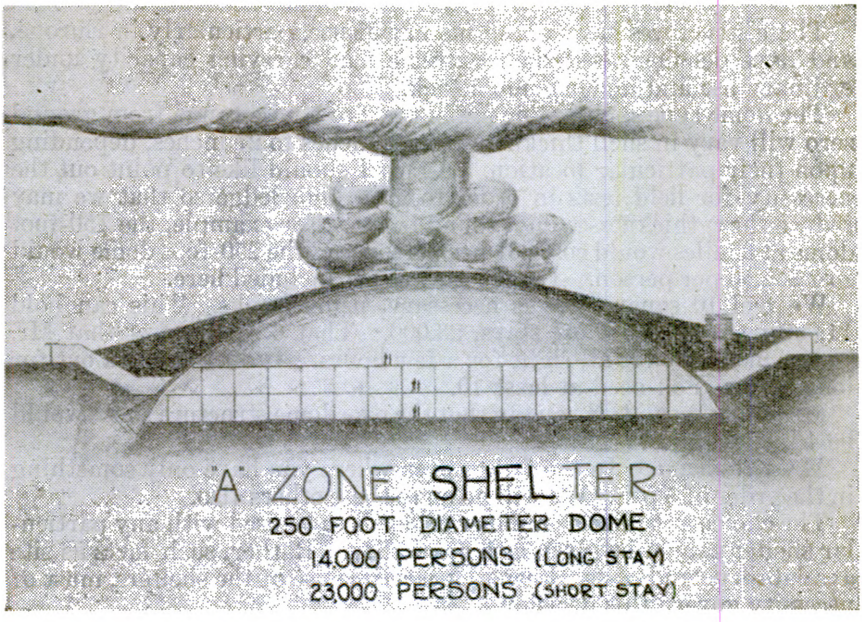
Mr. BOWMAN. I don't think any such study has been made.

Mr. FASCELL. Nor the cost of such a program.

Mr. BOWMAN. Well, I made a figure this morning just to amuse myself, not to amuse myself but to inform myself.

Mr. FASCELL. Just sort of a guestimate?

Mr. BOWMAN. Yes, sir. The statement was made that there was 60 million people in urban areas and this morning Mr. Cohen said $300 per person and the product of those is $18 billion.



I may differ here with Mr. Cohen in that it may be true that when you go too thin in concrete you need additional radiation protection but we feel that earth is cheaper than concrete and the total cost comes out to the good.

You may note that there are two floor levels inside the structure. We appear to have a lot of waste space up here, but we do not consider it waste space. In a period of several days when people may be sheltered here, the air there may be badly needed.

The second figure shows a 250-foot diameter concrete dome with 3 floor levels inside it. Both of these structures have been analyzed and their design is generally considered to be actually on the conservative side. Full-scale tests should lead to increased knowledge of their behavior and a probable reduction in thickness, and hence, cost.

Since this point, cost, has been brought up, it might be well to discuss the costs associated with these structures along with the technical aspects.

These dome shelters could be used not only in the 2 to 5 mile ring, but may also be used quite effectively for the fringe areas fallout shelters. We have talked about getting the people out of the cities. We need to put them in something.

Existing cost records of recent concrete shell construction indicates that the superstructure for such a dome in the fringe area should not exceed $4 per square foot of floor area and is only 4 inches thick with 3 feet of earth cover. Our analysis would indicate that a two level dome in the fringe area including the cost of the shell, earth cover, foundation, and interior floors, etc., should not exceed $43 per person, allowing a rather liberal 10 square foot per person for occupancy, that is, long-term stay.

72796—56—pt. 3——26

These structures have a long history of use, particularly in Europe, and have demonstrated their extreme load carrying capacity under ordinary use and under bomb attack.

The dome type shelters for use in the 2 to 5 mile range from ground zero will vary in shell thickness from 8 inches to 27 inches, depending upon their particular location. Again I should like to point out the necessity for field tests in order to gain knowledge so that we may reduce these thicknesses on a sound basis. For example, the 150-foot dome at 3 miles would cost $61 per person and the 250-foot dome would cost $62.50 per person. Land costs are not included here.

We feel 10 square feet is necessary, using bunks. This can hold 14,000 persons, for short stays, 23,000. That 6 square feet that Mr. Cohen mentioned is all right for a few hours. It doesn't work out for long stay. You need at least 10.

Mr. HOLIFIELD. Did you say that the overdome structure there would be 4 inches thick?

Mr. FITZGERALD. In the fringe area where you have only something in the order of 5 psi. We will go on to these others also.

The choice as to size or number of levels to be used with any particular shelter cannot be given as a generality. Rather, such facts as site availability, land costs, alternate peacetime use of the shelters, must of necessity govern this decision.

It might be added that in downtown areas the etremely high land costs might lead to a solution where one uses a much more expensive underground shelter, but here the total cost might be less than using a less expensive aboveground shelter on extremely high priced land.

None of the above cost figures are probably the actual costs if a large-scale shelter program should be embarked upon. It is quite obvious that considerable savings could be made by the use of specially designed, reusable forms and engineered construction methods.

The cost comparison of a dome type structure with an arched shell or a rectangular-type structure can, nevertheless, be crudely made. Studies have shown that for the coverage of large areas, the use of a dome will invariably be less than that of an arched shell or a rectangular structure by one or two orders of magnitude. On moderate priced land, the dome will still be cheaper even though the land use is less efficient.

That is 30 pounds per pressure over pressure. Land costs are not included here. We will go on to those later.

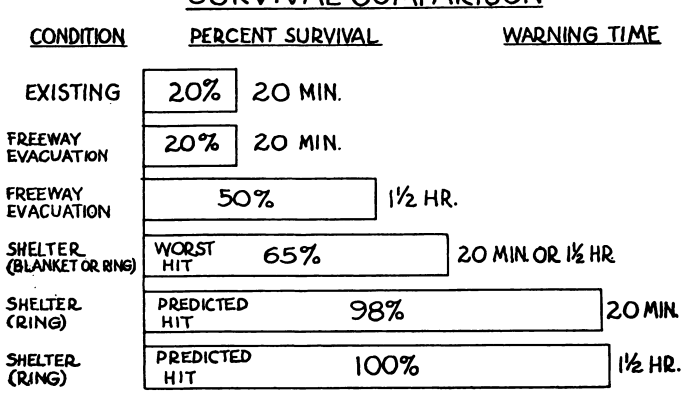
The combination of small high pressure underground structure perhaps similar to those tested by FCDA in Nevada costing $400 per person on a 10 square foot basis, and large fringe area shelters costing as low as $35 per person should lead to a complete shelter program for the entire country costing approximately $50 per person.

This lower figure should be possible on a national basis and leads to a total figure of $8 billion for the Nation as a whole.

Spread out over a 4-year building program, this would amount to $2 billion a year, or approximately 6 percent of the defense budget per year.

It would certainly seem that a defense effort which although eminently successful in destroying an aggressor, allows 50 to 100 million citizens to be annihilated is hardly a successful defense. Before anyone would consider seriously such an expenditure, however, we should look at the survival comparison between evacuation and shelter.

This graph shows a comparison of survival for shelter and evacuation. Before commenting on the numbers, I should define a few of the terms.



As you note, the last three bars apply to shelter. I have defined two types of shelter layout. One I term ring shelter, and the other blanket shelter. By ring shelter I mean a layout whereby one predicts an anticipated ground zero. The shelters are then built in the 1½- to 5-mile annular ring surrounding this aiming point.

In general, this philosophy has been used in the survival studies carried out by FCDA. The aiming point has generally been chosen to maximize the damage that an H-bomb could inflict on a city based on population density.

If one relies upon protective construction in such a ring, however, it will readily become apparent to any aggressor that a new aiming point should be chosen so as to maximize the damage upon the shelters. In other words, no matter how clever one is at moving shelters away from ground zero, this very condition will create a new condition for ground zero.

With this previous thought in mind, we have considered another shelter pattern which I refer to as blanket shelter. The philosophy here is to simply place these shelters more or less uniformly spread throughout the entire 5-mile ring covering the greatest population density in Milwaukee. It is apparent that to do this might seem rather heartless and cold blooded insofar as one could interpret this as condemning several thousands of people to a sure death in the event of an attack. However, before leaping to such a conclusion, one should consider the fact that we do not know the enemy's aiming point and we do not know his aiming accuracy. Hence the most we can do is attempt to minimize the casualties assuming the worst condition of attack. Now let us look at this graph again.

Starting from the top, if we do nothing in our typical example city, Milwaukee, there will be only a 20-percent survival; that is more than 800,000 Milwaukee citizens will be killed. Now if we spend the $78 million for the improved freeway evacuation method, the results of the Wilbur Smith study show that for a 20-minute warning time which is insufficient for a mobilized evacuation to get rolling, we again will have only a 20-percent survival.

In the case of a 1½-hour warning time and the expenditure of $78 million, the survival will be increased to 50 percent, or approximately 500,000 persons.

The last three bars pertain to shelter survival. Using either a blanket- or a ring-shelter method, the two cases happen to give approximately the same result for Milwaukee—one was about 63 percent the other was 64 percent—and assuming the very worst, from our standpoint, placement of a 20 megaton surface burst weapon, there will be a 65-percent survival for either a 20-minute or a 1½-hour warning time.

This is based on a walking evacuation at 2 miles per hour with no one person walking more than a half hour. That is reasonable. It is backed up by operation Scat. These tests were carried out in Seattle and Mobile with walking evacuation. They (the test) agree that is conservative.

Mr. ROBACK. Which direction are you walking?

Mr. FITZGERALD. Toward the shelter. The farthest is one-half mile. If you make a mistake you can't go far wrong.

People in the various office buildings would be told "You go to this one." If you happen to be away from home, you don't have to know whose car shall I get in to evacuate. Run with the crowd to the nearest shelter.

Mr. FASCELL. What happens if you meet everybody else in town at the same shelter?

Mr. FITZGERALD. In general this will not happen because the average person working in the city knows which shelter he can go to. There will be at 5 or 10 percent fringe which is not where they are supposed to be and these shelters could take it and we reduce the space from 10 square feet to 9 square feet.

I don't think this is a major problem.

If, however, it is true that we can rely on the predicted ground zero as defined by the FCDA, the use of ring-type shelter will provide 98 percent survival with 20-minute warning time and complete or 100 percent survival with 1½-hour warning time.

I do not believe these last figures because I don't think there is a ground zero we can talk about so the 65 percent is it.

Total cost figures for these shelters cannot be given immediately, but I think it reasonable to state on the basis of uniform costs given previously, that the entire shelter program should not exceed the freeway stage evacuation program in cost.

Far more importantly, however, the shelter program provides immeasurably greater advantage in that many additional thousands of human beings will survive.

To summarize, present technology of warfare using large megaton bombs invalidates the centuries-old principle that if the Armed Forces in the field are successful in holding the line, the civil population is safe. This change started in World War II on a limited scale. Evacuation under existing conditions would lead to as much as 80 percent casualties in the event of a short warning attack. Improved evacuation will be costly and still lead to as much as 60 percent casualties.

It is poor comfort to the civilian population to that extent to note that the enemy has been annihilated but that only 20 to 40 percent of our population has survived.

The contract with Lehigh involved a study of British shelters during World War II and the development of various types and methods, and designs of shelter structures for backyards, for family purposes, for reinforcing basements of homes to provide shelters. As I remember, there were two types of what would be referred to as communal types of shelters, where 50 or 100 people would be sheltered in one structure, rather than a very few people at their home or in the backyard. There were some cost and dispersion studies of shelter programs made as a part of that contract.

That data of course were turned over to civil defense and I believe a good many of the designs that appear in the FCDA manuals which were referred to yesterday resulted from those studies.

Another field which we were interested in at about this same time and which I think should be a little further described here is our participation in what was referred to yesterday as the Greenhouse program of atomic tests in the Pacific in 1951.

Mr. Cohen, who testified yesterday, represents the firm of Ammann & Whitney which we engaged in 1949 to undertake the design of the test structures which we proposed to build and test during the program as a part of the Army portion of a military structures effects test.

Our proposed design was very unusual at that time in that we felt a structure could be designed to resist the dynamic loading of the atomic blast pressure which occurs over a very short period of time, a matter of less than a second in that case, and that if it could be determined how the structural elements behaved during this relatively short period of time, for comparison with predictions it might be possible to work out design procedure which would be applicable to a wide range of structures other than the ones we were testing.

It is very costly to test every type of structure in which one might be interested. It would require years and years and one would probably never know for sure how to apply the results to a structure which you had not already tested. So the Corps of Engineers portion of that test program was oriented not just to finding out whether a structure would stand or fall down but how various elements that make up a building or a surface structure would behave, so that the knowledge could be applied to other designs and for other shapes and configurations of buildings.

In that respect we felt we were very successful in that when we checked back after we had the measured results we were able to confirm the design based upon the dynamic analysis. We hoped that by measuring at literally thousandth increments of a second during the time the pressure was working on the test structure what it was doing and how far it was deflecting or displacing, we can from that type of information develop a design procedure which could be applicable to many other structures.

That was accomplished by this program and we are now in the process of putting the information in manual or useful form for military construction purposes. I say military because we have no authority to write manuals for dissemination of such information to the general public.

During the time that Ammann & Whitney were designing this test structure for us the Civilian Defense Office of the National Security Resources Board approached us again with respect to getting assistance on a manual that they were considering.

CIVIL DEFENSE FOR NATIONAL SURVIVAL

(PART 4—Dr. Arthur S. Flemming, Dr. William H. Stead, Hon. True D. Morse, Hon. Rocco C. Siciliano, Hon. Val Peterson, and Benjamin C. Taylor)

HEARINGS

BEFORE A

SUBCOMMITTEE OF THE COMMITTEE ON GOVERNMENT OPERATIONS HOUSE OF REPRESENTATIVES

EIGHTY-FOURTH CONGRESS

SECOND SESSION

APRIL 10, 11, 12, 17, 19, MAY 15, 17, AND 18, 1956

Printed for the use of the
Committee on Government Operations

UNITED STATES
GOVERNMENT PRINTING OFFICE
7279 WASHINGTON : 1956

COMMITTEE ON GOVERNMENT OPERATIONS

WILLIAM L, DAWSON, Illinois, *Chairman*

CHET HOLIFIELD, California
JOHN W. McCORMACK, Massachusetts
EARL CHUDOFF, Pennsylvania
JACK BROOKS, Texas
LESTER HOLTZMAN, New York
ROBERT H. MOLLOHAN, West Virginia
L. H. FOUNTAIN, North Carolina
PORTER HARDY, JR., Virginia
JOHN A. BLATNIK, Minnesota
ROBERT E. JONES, Alabama
EDWARD A. GARMATZ, Maryland
JOHN E. MOSS, California
JOE M. KILGORE, Texas
DANTE B. FASCELL, Florida
MARTHA W. GRIFFITHS, Michigan
HENRY S. REUSS, Wisconsin

CLARE E. HOFFMAN, Michigan
R. WALTER RIEHLMAN, New York
CECIL M. HARDEN, Indiana
CHARLES B. BROWNSON, Indiana
GEORGE MEADER, Michigan
CLARENCE J. BROWN, Ohio
GLENARD P. LIPSCOMB, California
B. CARROLL REECE, Tennessee
J. ARTHUR YOUNGER, California
VICTOR KNOX, Michigan
OTTO KRUEGER, North Dakota
CHARLES R. JONAS, North Carolina
WILLIAM E. MINSHALL, Ohio

CHRISTINE RAY DAVIS, *Staff Director*
ORVILLE S. POLAND, *General Counsel*
WILLIAM PINCUS, *Assistant General Counsel*
HELEN M. BOYER, *Minority Professional Staff*

MILITARY OPERATIONS SUBCOMMITTEE

CHET HOLIFIELD, California, *Chairman*

EDWARD A. GARMATZ, Maryland
JOE M. KILGORE, Texas
DANTE B. FASCELL, Florida
MARTHA W. GRIFFITHS, Michigan

CLARE E. HOFFMAN, Michigan
R. WALTER RIEHLMAN, New York
GLENARD P. LIPSCOMB, California

MEMBERS EX OFFICIO

WILLIAM L. DAWSON, Illinois
CLARE E. HOFFMAN, Michigan

MICHAEL P. BALWAN, *Staff Director*
HERBERT ROBACK, *Director of Investigations*
JAMES F. ECKHART, *Assistant Counsel*
EARL J. MORGAN, *Investigator*
ROBERT J. MCELROY, *Investigator*
CAREY BREWER, *Legislative Reference Service, Library of Congress*

CONTENTS

APPENDIX

CIVIL DEFENSE FOR NATIONAL SURVIVAL

TUESDAY, APRIL 17, 1956

HOUSE OF REPRESENTATIVES,
MILITARY OPERATIONS SUBCOMMITTEE OF THE
COMMITTEE ON GOVERNMENT OPERATIONS,
Washington, D. C.

The subcommittee met, pursuant to adjournment, at 10:10 a. m., in room 1501, New House Office Building, Representative Chet Holifield (chairman of the subcommittee) presiding.

Present: Representatives Holifield, Mrs. Griffiths, Kilgore, Riehlman, and Lipscomb.

Also present: Michael P. Balwan, staff director; Herbert Roback, director of investigations; Earl J. Morgan, investigator; James F. Eckhart, assistant counsel; Robert J. McElroy, investigator; and Carey Brewer, Legislative Reference Service, Library of Congress.

Mr. HOLIFIELD. The subcommittee will be in order.

This subcommittee has been engaged since January 31 in exploring the problem of civil defense in many fields. We purposely adopted this method of exploration so that the committee itself would be well informed on these subjects before we called the Federal Civil Defense Administration before us.

We intend to give the Federal Civil Defense Administration a complete hearing for as many hours as they desire to present the story of civilian defense. We feel that these public hearings are important to the Congress and to the Nation. It will provide a means for the American people to realize the enormity and the importance of this problem.

This morning we are very happy to have before us a most distinguished witness, Gov. Val Peterson, who is the Administrator of Civil Defense.

Governor Peterson has some prepared statements which I understand have been released to the press and which he wishes to give at this time.

Governor Peterson, the committee is happy to have you before us and you may proceed with your statement as you planned.

STATEMENT OF HON. VAL PETERSON, ADMINISTRATOR, FEDERAL CIVIL DEFENSE ADMINISTRATION; ACCOMPANIED BY H. L. AITKEN, EXECUTIVE ASSISTANT ADMINISTRATOR, FEDERAL CIVIL DEFENSE ADMINISTRATION

Governor PETERSON. Thank you, Mr. Chairman and members of the committee, I am very pleased to have this opportunity to appear before your committee. I might suggest in starting that in the time

72796—56—pt. 4——9

that Civil Defense has been in being there have been just two congressional committees who have paid any attention to Civil Defense aside from the Appropriations Committee. One was the subcommittee of the Senate Armed Services Committee headed by Senator Kefauver which conducted hearings last year and then this committee which is conducting these hearings this year.

We are pleased to have this attention on the part of the Congress of the United States.

I should like to read 2 or 3 statements here this morning for the record. Then, of course, I am open to questioning on the part of the committee as you see fit and as are also the members of my staff who are assembled here this morning. I am very happy that you and the members of your committee were able to visit our headquarters at Battle Creek yesterday and am sorry that under doctor's orders I was not able to accompany you on that trip. I hope you found it profitable and worth your time.

I should like to outline for you today the civil-defense problem, as I see it, in broad terms and subsequently to discuss what has been done in civil defense at the Federal level, what we are now doing, and what we propose to do in the future.

Your group is considering the question of whether civil defense is now adequate, and what may be done to make it effective against the awful threat of thermonuclear warfare.

It has, by this hearing, also assumed the perhaps unappreciated task of increasing national awareness of this threat to the United States; you have shown an appreciation of the need for a program that would truly reflect the obligation of every American citizen to defend himself, his family, and his homeland in the event of an enemy attack.

Like those of us who bear the responsibility for administering Federal civil defense, you wish that the civil defenses of this country were more extensive and more enthusiastically supported by the public.

I expect that you would agree with me that there are no magic solutions to the grave problems of our national civil defense, and that in the laborious search for the means of our Nation's ultimate survival there are no glamorous substitutes for experience, patience, and hard work.

After I had held my present position about a year, a newspaperman wrote a piece in which he said, "This man's assignment is such that for 1 year he has been staring into hell."

Now, I have been staring into hell for 3 years. It's not a very pleasant experience. What did he mean by saying we were looking into hell? He meant simply this:

Man has now invented weapons of such destructiveness and the means for delivering these weapons over long distances that he has about reached the point—not quite yet, but about reached the point—where he can commit suicide upon this earth if he sees fit to indulge in a thermonuclear war.

We need not await the arrival of the intercontinental ballistic missile to picture whole regions of our land laid waste. You have heard Dr. Libby detail the effects of the nuclear weapons of today, the city destroyers exist at this moment, and in quantity, complete with the means for their delivery.

Only 300 such weapons with an explosive force of 10 megatons each, laid in the proper pattern, could devastate or damage so severely as

to render useless most installations in an area 60,000 square miles in extent. Only one-third that number of similar weapons would inflict some sort of blast or thermal damage to most buildings in a comparable area.

The 5 boroughs of New York City cover only slightly more than 300 square miles, sprawling Los Angeles less than 500. When we relate these figures to the weapons potential I just referred to, we cannot escape the somber realization that the shadow of absolute destruction has been cast.

I strongly believe that national security requires, in the final analysis, total preparation against total war. Total, because every American family could be a target.

But President Eisenhower warned more than 2 years ago in an address to the United Nations, that the safety of all persons and all cities simply cannot be guaranteed even by the expenditure of vast sums for weapons and systems of defense.

The President pointed to the "awful arithmetic" of nuclear weapons and stated that a surprise attack by an aggressor using these weapons could cause hideous damage despite the most powerful military defense.

As the committee knows, there is no complete defense against such an attack.

Let there be no mistake, if war comes it will exact a fearful toll of civilian lives. Every citizen will be on the firing line. The Government could no more guarantee individual life than could a division commander in combat guarantee the life of each individual soldier.

Perhaps I don't need to dwell upon the destructiveness of modern weapons but a statement of their specific effects on an American city is the logical introduction to the problems we face.

A 20-million-ton weapon will create a radius of total destruction of 5 miles.

If it is detonated on or near the ground there will be a crater about a mile and a half across, 200 to 250 feet deep— so the buildings will be gone after the bomb goes off and a hole will be there, and nearly everyone within that 5-mile radius would be dead.

The spot where the Capitol and this building stand might be just a lagoon filled with the waters of the Potomac. There might be such a thing—4 or 5 miles out—as a man having a good enough shelter to live through it, but it would take a well-constructed shelter, and a large amount of good fortune.

The radius of heavy destruction is another 5 miles. The third radius of moderate damage is 5 miles. And the fourth and last radius of light damage is 5 miles. That's destruction and damage for a radius of 20 miles.

Within this radius, there will be a thermal wave that will go out for many miles, dependent on the atmosphere on the day and at the moment of the explosion of the bomb. Initial radiation will be generally lethal only in an area where blast and heat have already taken their toll of human life. But in addition, there is the fallout problem.

Lingering radioactivity in the fallout from the cloud can cover thousands of square miles and it can bring death to people if they do not get under the ground or get other protection. These elementary facts paint a grim picture, but it is not a hopeless picture as yet.

Some persons have stated that the weakness of civil defense is more than weakness—that civil defense is nonexistent. This statement should be summarily rejected.

It does a great disservice to the thousands of dedicated Americans who have faced up to the facts of our times and who have assumed responsibility for civil defense in their communities.

The shortcomings of civil defense are nowhere more apparent than from the offices of those who are responsible for it. I believe we see the shortcomings in our progress across the Nation with much greater clarity than do our critics. But we also see our problems with greater clarity. Any allegation that civil defense does not reflect a recognition of the terrible implications of nuclear warfare is nonsense. Those who live with these problems from day to day have a much sharper realization of the consequences of unpreparedness than do those who make periodic and sometimes emotional discoveries about the threat of nuclear warfare.

This is not to imply that civil defense is adequate. Far from it. There is serious question whether defense, civil or military, can ever be adequate—in any normal sense—to meet today's weapons and those of the future.

The plain fact is that national civil defense exists. It did not exist 5 years ago. There is scarcely a city, county, or hamlet which does not have a civil-defense director. All States now have civil-defense laws and organizations.

We recognize our shortcomings, but we also recognize our accomplishments. These accomplishments are not always clearly visible, because they are gradual and seldom spectacular.

Five years is a short time, but civil defense in modern times is scarcely older than that. And in 5 years we have seen weapons develop from the atomic bomb of Hiroshima size to multimegaton giants that create entirely new dimensions of catastrophe.

In that period we have gone from the possibility of very little warning time to hope of enough warning time for positive action, and we face a future when warning time may again be reduced to almost zero.

We have gone from the time when disaster could be expected to affect only relatively limited areas, even though the areas would be large, to the possibility of almost unlimited disaster caused by the secondary effect we call fallout. In 5 years we have gone through periods of great international tension and periods of great hope.

The clear eyes of hindsight sometimes fix on an action of the past as having been a glaring mistake, but I must wonder if we had those days to live over again whether we would have made any other decisions.

Certainly, we could not know in the fall of 1950 that we would reach the spring of 1956 without having a general war. Our predecessors in civil defense became responsible at a time when we were fighting in Korea.

That single circumstance required action rather than contemplation. Mistakes were made but they were remarkably few.

In the last analysis, we must judge the performance not against any absolute scale but in relation to the size, the nature, and the difficulty of the problem.

Even now the entire staff of the Federal Civil Defense Administration includes not many more people than a single infantry battalion. The States and cities add only enough full time paid civil defense people to amount to a single regiment. In those few hands rests, at the moment, heavy responsibilities for the survival of 160 million Americans.

This is not a complaint. I am proud of the accomplishments of my staff, and of the civil-defense staffs in the States and cities. I am proud of the progress they have made in tackling a terribly complex problem with only the slenderest of resources.

The civil-defense workers have substituted devotion for dollars and have made brains, hard work, and long hours take the place of needed additional manpower.

Together they have acquired an operational capability; they have established an emergency communications system that reaches every part of America; they have installed the main elements of an attack warning system, working in close cooperation with the Air Force; they have stockpiled appreciable amounts of emergency supplies; and they have alerted a large part of the American public to the dangers we face and to the need for taking steps to survive these dangers. For a long time we were about the only voice in America discussing these matters at all, official or unofficial.

In short, national civil defense has undertaken a staggering job with a handful of full-time people, augmented by volunteers. I make no apology for the results. Under the circumstances, they have been magnificent.

I salute the thousands upon thousands of volunteers who have given freely of their time, effort, and ingenuity. These volunteers cannot receive too much praise. We are all in their debt and only too often their sacrifices go unrecognized even by their neighbors. Their predecessors were the air-raid wardens of the Battle of Britain; anonymous until war came, then respected, honored, and decorated.

You cannot beat volunteers when it comes to meeting a crisis or a short-term emergency, but there is great difficulty in maintaining the volunteer spirit, year after year.

On the other hand, a paid army of professional civil-defense workers adequate to the job is not a feasible alternative. We undoubtedly need an appropriate combination of both.

It would be unrealistic to assume that merely by the expenditure of money, the uniforming of men or the addition of equipment, the Federal Government could solve the civil-defense problem.

Under the Federal Civil Defense Act of 1950, Public Law 920, Federal Civil Defense Administration recommends, advises, and offers guidance to the States. We do not order nor do we direct. We have no command functions over these people.

While I agree that more Federal authority is needed, any additional authority beyond that prescribed in the present law must not result in any diminishing of effort at the local level.

One of the basic problems of civil defense has been to obtain recognition on the part of Government officials at all levels that they have a definite responsibility for the success of this program.

I must add that I am familiar, of course, Mr. Chairman, with your statements during the past year that greater Federal responsibility and operational control are in order.

I know of no governor or mayor who thinks that the Federal Government should accept less than a role of joint responsibility.

You may ask, as I ask myself, what can we accomplish with our civil-defense endeavor? The answer is that a strong civil defense can be a significant contribution to the attainment of a just and lasting peace in the world.

For civil defense can be a great deterrent to war. It also can have lasting values in peacetime.

And in my judgment, assuming that the Russians can develop bombs and carriers in sufficient number and quality, assuming further that the Russians would attack the United States without notice, it is my belief that if we do not take more effective action in passive defense, nonmilitary defense or civil defense, whichever you want to call it, we could lose the war on that basis alone.

A major accomplishment of civil defense is in natural disaster activities. Many of the people of a community struck by disaster may not have known of its existence before the fact, but they knew it afterward.

Peacetime disasters have more than justified the cost of civil defense. Civil defense has acted in more than 100 emergencies in which the President has declared various portions of the country to be disaster areas.

We have learned, and we are still learning, to cope with the destructive forces of nature on a regional basis, rather than city by city or State by State.

I notice that this committee has paid very little attention to this phase of civil defense and I trust while I am a witness you will question me about this area because I think we are establishing a pattern here that will be of great consequence in the development of a sound civil defense in the event of an attack.

As this subcommittee knows, the Federal Civil Defense Administration is now the coordinating agency for natural disaster relief at the national level.

I welcome the peacetime challenge it offers to our organization, and I am proud of the vigor with which my staff has tackled these exacting responsibilities.

If there were no nuclear threat to the safety of this country, we could still use civil defense.

In all but a few States, legislation now provides for civil-defense organizations to take over rescue and relief problems in peacetime emergencies. This is important, because we have about 3 major local disasters every 2 days in this country—train wrecks, airplane crashes, fires, floods, industrial explosions, and the like.

State and city civil-defense organizations have functioned effectively in this area in the past, and continue to do so.

I venture to say that no community where civil defense has turned out to meet a situation that threatened to overwhelm its regular protective services will ever again want to be without civil-defense training and organization.

I know that is true in places like Massachusetts, Connecticut, Pennsylvania, California, North Carolina, and many other places in the United States.

And I can assure you that many places which lacked local civil-defense organizations of their own in the past, when emergencies arose, now have them. Adversity is sometimes a great teacher.

I am sure the chairman and members of the subcommittee would be the first to agree with me that there are no simple solutions or fully adequate precedents for the complex problems of civil defense today; there is no easy out for civilians.

From the very beginning we have taken advantage of the best thinking we could get on civil defense. We have built on the substantial accomplishments of our predecessors. We have studied the experiences of the British, Germans, and Japanese. We have earnestly attempted to get the best measure of civil defense for every dollar that we have been able to invest.

The principles on which civil defense must operate have remained constant regardless of changes in weapons. This is because there are only two essential principles that have any validity against nuclear weapons regardless of their size: These are the principles of protection by distance, and protection by shielding. One can either get beyond reach of nuclear effects or take shelter from them.

There is no other way.

Necessarily, emphasis on these principles has varied. It may vary again. The degree of variation must take into account not only what is ideal protection, but what is feasible. And it is at this point that most disagreements arise, for not even our severest critics have proposed any other principles.

We shall not advocate that we abandon our cities and establish a different kind of civilization. To me, civil defense is a means of preserving and safeguarding lives and the spiritual, intellectual, and material resources which have made this Nation great.

I also believe that only those actions which are clearly essential for national survival should be done in the name of civil defense.

If we are really serious about surviving in the United States—and I don't see too complete evidence that we are fully so—individually and at all levels of government, there are many things that we can do to prepare for attack as of today. What are these things?

We have used the World War II experiences of European countries to develop plans for the postattack, or mopping up phase of civil defense.

As I mentioned before, civil-defense organizations have been set up in every State, city, and Territory.

In that phase I think we have done a reasonably good job in the United States. We vary from city to city and State to State. Some States are doing better than others; some cities are doing better than others.

Some of them are doing a very poor job as a matter of fact.

But in the rehabilitation and mopup phase, the techniques are known; the guidance is published. I don't mean to sound complacent however. We have more to learn in this phase now because we have the problem of radioactive fallout. Much remains to be done in recruitment and training. We will never have enough trained civil-defense workers.

The other area includes those lifesaving things that can be done before the bomb goes off. That is where a more productive area lies, it seems to me, in civil defense. What can we do there?

Of most significance are the survival plan studies begun by the Federal Civil Defense Administration last year. Here we are financing studies that will create the most realistic operational plans for our target areas. When they are completed, city and State civil defense people will have, as the result of Federal financing and guidance, operational plans tailored to their individual circumstances.

These plans and the resulting programs will reflect the optimum combination of evacuation and shelter, and provision for reception, feeding, housing, and related welfare needs, including medical care.

They are being made to meet contingencies arising from a variety of attack patterns, warning times, and weapons.

This work has not merely been proposed, it has begun, and I know of no more effective approach that has been made to aid the cities and States in finding solutions to civil defense problems. We will strive to solve, in the most practical terms possible, the problems of protecting our population.

That, very briefly, is our survival study program.

The studies are necessary, and civil defense is necessary only because in the past nations have never been able to refrain from war for very long.

As a matter of fact, I recall reading some place that for every year of peace there have been 13 years of war in recorded history.

The country will require the existence of civil defense as long as the military is unable to offer complete protection to the people from an attack on our cities.

And our American military, in my judgment, is doing the very best job it can. But it is clear that a resolute enemy who sees fit to attack us and is willing to pay the price can put enough bombers over enough of our cities, carrying enough nuclear bombs, to bring a terrific destruction upon the people of the United States.

As you know, the Office of Defense Mobilization has recently delegated to FCDA authority in the program of reduction of urban vulnerability, including certain aspects of industrial dispersal.

The proper execution of these programs may have great bearing on our survival as a nation. In this connection I repeat there are only two essential principles with any validity against nuclear weapons: distance and shielding.

As far as distance is concerned, we have two ways of using distance: Evacuation, both strategic and tactical, which I have mentioned briefly in connection with the survival plan studies, and dispersal.

In talking of dispersal, I do not mean transplanting existing industry to areas that may now be less vulnerable, but simply that in the future expansions of industry be placed so as to reduce our vulnerability.

I am convinced that recent enormous advances in communications and transportation make possible such dispersal without sacrifice of productive strength.

In the era of intercontinental ballistic missiles, when our potential tactical warning time will be drastically shortened, dispersal appears the most effective preattack defense measure.

The other essential element of defense against nuclear weapons, shielding, is simply the employment of shelter.

We have designed and tested shelters that offer effective protction even within the A-damage ring of nuclear weapons. The cost is still

quite high per person. We are continuing to work on the problem, and we have considerable hope that equal protection can be provided by less expensive designs now under consideration.

We are also making substantial progress on improved shelter designs for incorporation into new homes, shelters that will afford much greater protection than the home designs now available, and at a cost which will be acceptable, financially, to our citizens.

When our survival studies are completed, we will have much more specific information on shelter needs. But now we believe that a sound shelter program is possible and at a cost which this Nation can afford.

In the end civil defense requires the participation of the people of America. There is no way—and there should be no way—to reimburse the head of a family for making the elementary preparations that will provide protection for his family.

There is no reason for paying people to learn the techniques of first aid, or for insuring that a sufficient supply of food is on hand for the family's personal use for a few days.

On the other hand, while the individual must assume the responsibility of learning the facts of civil defense, it is the responsibility of FCDA to see that proper information and leadership is available.

In closing I should like to state that there is no certainty that any nation can survive an all-out assault with the thermonuclear weapons of our time. I only know that the destruction and loss of life would be terrible, and that it is late, and that we have much to lose.

I know of no easy answers in this business of civil defense. And I would be very distrustful of anyone who suggested any such easy answers. No one I know has such answers. There is no such thing as being ready for a war of this kind in any absolute sense.

By that I mean the military is not ready, civilians are not ready, civil defense is not ready, no one is ready for a thermonuclear war and no one will ever be fully ready for a thermonuclear war except in the very limited sense that some one might have his battalions in uniform or have airplanes ready to fly.

And I am speaking now about civil defense—city, county, and local government, the Federal Government, the military, the scientists, everybody in America and in the world—nobody is ready for this kind of war.

But we must do the best we can.

We are kidding the people if we lead them to believe that we are ready for this kind of a war.

Speaking for my agency, I know that we are doing our very best. With thoughtful help, constructive advice, and more widespread support I am sure we can do better. But as of today I know that intelligent, devoted, hardworking people are giving their best efforts to solve the problems of civil defense.

Thank you.

Mr. HOLIFIELD. Thank you, Governor Peterson, for your presentation.

This presentation deals quite a bit with the philosophy of your Department and I believe that we should not pass it without some comments upon it, although I recognize the fact that you get into more specific detail in your second statement.

So at this time we will give the committee an opportunity to ask some questions of the Governor on this particular part of his testimony.

Mrs. Griffiths?

Mrs. GRIFFITHS. I have no questions.

Mr. HOLIFIELD. Mr. Riehlman?

Mr. RIEHLMAN. Mr. Chairman, I would prefer to ask some questions on the other part of his testimony, which I understand he is going to give immediately following this statement.

Mr. HOLIFIELD. Mr. Lipscomb?

Mr. LIPSCOMB. The same, Mr. Chairman.

Mr. HOLIFIELD. Mr. Kilgore?

Mr. KILGORE. I have the same viewpoint. I would like to wait until after the second statement.

Mr. HOLIFIELD. I think we should probably explore just briefly a few points in this general statement. The picture which you have given us has been a pretty grim picture of the impact of nuclear warfare upon a highly developed nation, such as ours, Governor Peterson, and I can state that I agree with your statement as to the likelihood of havoc and chaos in our country if we were hit at this time by nuclear warfare from a first-class power.

However, you also say in your statement that there are things that can be done. The exploratory operation of this committee is to find out what can be done, what has been done, and what should be done in this field.

We are not out to criticize the people of the Civil Defense Administration. We recognize that you have a corps of people that are highly devoted to this work, but we also recognize the fact that we have an obligation as Members of Congress to the American people to discharge our responsibility.

In your statement on page 3, you say that President Eisenhower warned more than 2 years ago in an address to the U. N. that the safety of all persons and all cities simply cannot be guaranteed even by the expenditure of vast sums for weapons and systems of defense. Of course the question before the committee is not to guarantee the safety of persons but to increase their chances of survival.

Down further you say:

The Government could no more guarantee individual life than could a division commander in combat guarantee the life of each individual soldier.

The problem is not whether the Government is expected to guarantee individual survival to the whole population but the real problem is can we do things that can reduce the number of casualties perhaps by millions.

Page 4, you say:

There might be such a thing for 4 or 5 miles out as a man having a good enough shelter to live through it—

referring to a nuclear attack—

but it would take well-constructed shelter and a large amount of good fortune.

On this problem we will want to explore with you what has been done by your Department in the shelter field, what you have advocated in the shelter field. We will want to explore the factor of these survival studies which you have ordered to be made, which means further delay in the advocacy of a shelter program for our Nation.

We wonder why with the knowledge that you have on hand and the knowledge that the Atomic Energy Commission has developed in the tests in Nevada in conjunction with your agency, where you participated in some of these tests and made some notable discoveries, we wonder why the American people have not been given a more effective program in the shelter field.

You speak of radiation. We know that there are enough facts known at the present time about radiation. Testimony before our committee by Dr. Libby of the AEC has indicated that patterns of radioactivity will occur hundreds of miles, hundreds of square miles downwind from a nuclear explosion and yet the people are no more protected today than they were at the conclusion of the first atomic hydrogen tests in 1952 and 1953 and 1954 from this radiation, and yet there are things that can be done to protect them and the attack might occur tomorrow and no such things have been done.

Words have been spoken but no effective program is now in being by the American people to protect them.

On page 5 you say:

That any allegation that civil defense does not reflect a recognition of the terrible implications of nuclear warfare is nonsense.

In all of your statements in the pamphlets that your agency puts out, it is well reflected that there is a recognition of this terrible implication of nuclear warfare. The thing that faces this committee and what we must explore is what has been done in this field to give these people protection against nuclear warfare?

You go on ahead on page 5 and say—

That this is not to imply that civil defense is adequate. There is a serious question whether defense, civil or military, can ever be adequate in any normal sense to meet today's weapons and those of the future.

We know at this time the power of the offense is in much greater degree than the power of defense, so we know that there cannot be either a guaranty of survival or a completely adequate program, but this does not excuse your department and the Congress and the administration from advocating the best program that is possible in this field.

Then you go ahead and say—

The plain fact is that national civil defense exists. It did not exist 5 years ago. There is scarcely a city, county, or hamlet which does not have a civil defense director. All States now have civil defense laws and organizations.

Well, this is a true statement only from a relative standpoint, because the civil defense that does exist is inadequate, and I don't think that even any of the most enthusiastic members of your department would say that we have any way near adequate, even 5-percent adequate.

Governor PETERSON. Does the chairman know of anything that is adequate for thermonuclear war including military defense?

Mr. HOLIFIELD. I know of many things that can be done.

Governor PETERSON. Do you know of anything that is adequate to meet that kind of war?

Mr. HOLIFIELD. If you mean completely adequate?

Governor PETERSON. Yes.

Mr. HOLIFIELD. My answer would be "No." If you mean improvements over existing conditions, my answer would be "Yes."

Governor PETERSON. So we have spent X number of billion dollars for a military defense that cannot completely defend the United States.

Mr. HOLIFIELD. That is true. We have not spent any ways near a relative or even one three-hundred-and-fiftieth as much to protect the 75 million people in our cities from the standpoint of the protection which they could have if a few billion dollars were spent. It may be that we are just a little bit out of balance, that we are spending $35 billion a year for a military defense, a strong right-hand punch, and leaving our glass jaw unprotected.

Governor PETERSON. I would have to agree with you utterly in that. I would suggest that when I was before the Appropriations Committee asking for as little as four or five million dollars for various items I have found that the judgment expressed by the chairman here does not necessarily correlate with that of the Appropriations Committee.

I find that in the Congress that there is a great lack of correlation on the part of Members of the Congress with reference to their division of responsibility between various committees.

Mr. HOLIFIELD. That is very true. One of the reasons we are holding these hearings is to develop that sense of awareness on the part of the Congress and to try to give you some help.

Governor PETERSON. I think that is very fine.

Mr. HOLIFIELD. That's the main reason for these hearings.

Governor PETERSON. I can assure you that the Kefauver hearings which I thought were helpful in this general area did not help particularly before the Appropriations Committee.

Mr. HOLIFIELD. I don't know about that, but I believe your appropriations have been better since that time.

Governor PETERSON. They have been better every year but slightly so.

Mr. HOLIFIELD. Not enough, I will go along with you on that thought.

On page 7 you speak of your emergency communications system that reaches every part of America. And the stockpiling of the emergency supplies. We will want to go into some detail on that. We have been briefed of course on the attack warning system, and I can say that I believe that your administration has done a good job as far as getting the warning down to the key points for distribution, but from that point on in the local States and communities, at this time I believe that there is a failure to carry through with the work that you have done in that field.

On page 8 you say—

Under the Federal Civil Defense Act of 1950, Public Law 920, Federal Civil Defense Administration recommends, advises, and offers guidance to the States. We do not order nor do we direct.

This is very true. The question is not whether you are complying with the Federal Civil Defense Act of 1950. We believe that you are. The question is: Is the Federal Civil Defense Act of 1950 adequate in terms of today's needs since the hydrogen weapon has been developed in 1952 and 1953 and the Federal Defense Act, Public Law 920, was passed in early 1951.

You say in the next paragraph—

I agree that more Federal authority is needed.

I think the committee agrees with that. The question is what plans does your agency have to ask for additional Federal authority? To come before the Congress and ask for legislation that will give you the authority that is needed to do a more effective job.

I think the subcommittee will concur completely with the praise for the volunteers in this whole field of effort but the question is: Can we do a good job with volunteers? Do we need some additional help from possibly National Guard organizations, Reserve Officer Corps organizations or even a Federal Civil Defense Agency based on State organized units as is prescribed by Congress in Public Law 364, I believe.

Governor PETERSON. Are you referring there to the State Guard, the enactment of last year?

Mr. HOLIFIELD. Yes.

Governor PETERSON. You may want to discuss that later in detail. I think it is unrealistic but we can discuss it at that time.

Mr. HOLIFIELD. That would be fine. We would like to have your testimony on that.

I think that it has not met conscious expectations.

Governor PETERSON. You are not going to get the Governor of a State to ask for appropriations for a State guard when he has a National Guard at his disposal during peacetime with about 90 percent of the total expenses of maintaining it paid by the Federal Government. It is contrary to the elementary facts of political management of a State.

Mr. HOLIFIELD. These are some of the things that should be brought out in further testimony.

Governor PETERSON. It is one of the things that looks good on paper but is probably of little significance when it comes down to doing something.

Mr. HOLIFIELD. Yes.

On page 9 you say:

> I know of no governor or mayor who thinks that the Federal Government should accept less than a role of joint responsibility.

We have copies of letters from the governors and the mayors which we have had placed in a committee print and which we will present to you at this time. Most of the governors and mayors complain about the lack of Federal responsibility in this field and they desire more in the way of not only of Federal guidance but Federal assistance.

Some of them have even gone so far as to say that a nuclear attack on the city of Chicago or Detroit was an attack upon the United States, and not just on the city of Detroit or Chicago.

They have even intimated that the Federal Government has a responsibility not only to fight wars on the perimeter but also to take a more definite responsibility in the field of sheltering the women and children of the men in the fighting forces and the people that are left behind, the old, the aged, and the younger children. So it is a question of what degree of Federal responsibility. Is it going to be a degree that results in a completely ineffective civilian defense in terms of giving people the chance to survive or is it going to be a responsibility for planning and for financial responsibility which will give the people a chance to survive? That is the question before the committee.

Governor PETERSON. I would offer just one brief comment. Obviously I am thoroughly aware of the attitudes of governors and mayors because I work with them constantly and have considerable

sympathy for the viewpoint that you expressed. But I point out two things, that the nature of civil defense is such that the attack will be on cities and States and counties where people live and we will have to use the instruments of the cities and States, the facilities they have, fire fighting and others. We can never have a civil defense that is totally a Federal responsibility in my judgment, unless we want to become a unitary type of Government which can be argued on its merits but which I personally could not accept.

I doubt whether the committee could. In addition to that we want to be careful that we don't fall into a trap here. There are some governors and mayors who have not met their responsibility in this field and would like to shove it off on George, would like to have the Federal Government assume it.

I would only argue that this job is so big and the nature of the problem is such that it will require the best efforts and probably some money as well on the part of the people at all levels of government, county, city, State and National.

I have no doubt that as time goes on it will require a greater acceptance of responsibility on the part of the Federal Government and I personally believe properly so if we can maintain the balance.

Mr. HOLIFIELD. I think I can agree with you on that statement. The question is the degree of Federal responsibility, and speaking as an individual, I would say that that degree of responsibility at this stage has not been borne and this is not a criticism of you as an individual at all.

It is equally a criticism of the Congress for not being aware of this situation, I think we all have to bear this burden of responsibility. All of us who have knowledge in this field.

Governor PETERSON. This field does not have the political glamor or appeal of the farm problems or the opening of the baseball season and many other things that Congressmen respond to more rapidly.

I understand that Congressmen—and I don't mean this in any critical sense at all, because I have practiced some in the field of politics myself—are pretty busy people and they can only respond to about so many things in the course of a day or a session and they will respond to those things where the pressures are felt and I am afraid there isn't very much pressure in the field of civil defense as yet.

As a matter of fact, one great American says that civil defense will never amount to very much until this becomes a political issue. I don't see signs of it being a political issue yet although I understand 1 or 2 mayors have been elected or defeated on this issue. Until the time comes that the Congressmen are subject to the pressures from home I doubt whether we will get very far educating them on the Washington level and I have some basis of experience for making that statement.

Mr. HOLIFIELD. Maybe this committee will be able to generate a little pressure at home. We are going into some of these cities and hold civil-defense hearings within the next 2 or 3 months and we hope to hear the story direct from the mayors and governors as to what their experience has been in dealing with the FCDA and what they think it would take to make an effective, a more effective civilian defense and what they think the Federal Government's responsibility is in that field.

That is one of the reasons why we are going into this problem. You say that civil defense can be a great deterrent to war and it can also have a lasting value in peacetime. I think that if the American people and even if the military people understood what a great deterrent a real civilian defense could be to a war, we would have a little more enthusiasm and support for civilian defense.

Governor PETERSON. May I quote a great American soldier maybe the greatest although it is dangerous I guess to start classifying soldiers.

General LeMay, after I had been placed in this assignment, told me that he thought that next to a strong striking air power, civil defense could be the No. 2 deterrent to war. He based that on an experience of his own in Japan during the last war where he went in to bomb certain targets and caught them unprepared and brought about a great degree of destruction.

He was not able to return for a week or 10 days. He was never able to complete his objective because in that interim period the Japanese had gone underground and scattered the facilities he was trying to knock out and he was never able to accomplish it. I think there is a great understanding of nonmilitary defense on the part of some members of the military, not all. As a matter of fact I assume the military has some difficulty to accommodating itself mentally to the facts of a nuclear age as do other people in life.

This is not critical of the military. We all find it difficult to understand the destructiveness of these great weapons. I would also like to say that if we don't have a strong civil defense we could very well lose the next war.

Mr. HOLIFIELD. And it could be an invitation to an enemy to attack us because a surprise attack of this type could throw us into such chaos as the military could not continue to function in their field. The logistics of supply and transportation would be so interfered with that it would be impossible for them to continue their military effort but for a very short length of time.

Governor PETERSON. I think it was Dr. Oppenheimer who in referring to a nuclear war between the United States and Russia said something to the effect that we would have two great scorpions lying in a glass jug mortally wounded.

I don't know that that is correct because if we assume that the Russians will have the advantage of surprise in the attack upon the United States, and assuming that they have in their stockpiles the weapons they need and the means of delivery of those weapons and those assumptions would seem to be sound, then by the fact that they name the time when the attack occurs, there is no reason why they should not have their cities evacuated, their people in places of safety, and when our retaliation takes place, there is no reason why we should be able to destroy millions of Russians in the same way they will probably destroy millions of Americans in view of our present degree of preparation.

In addition to that, such information as we have out of Russia would indicate that they are doing a much better job than we are in dispersing industry and going underground.

If they put a reasonable percentage of their war production potential underground and provide facilities for their people to go under-

ground at the edges of their cities and there is some indication that that is going on, as is the case in Europe generally, then it would appear that they have laid the foundation to minimize the effects of our retaliation in considerable degree. I think there is a real threat to the safety of America in that direction.

A while ago you were talking about giving the American people protection, I don't know exactly in what manner you were using the words——

Mr. HOLIFIELD. I will use your words. You say that there are only two principles, that they have remained constant ever since the advent of atomic and hydrogen war; one is protection by distance and the other is protection by shielding. That is what I mean. I will use your words to answer you.

Governor PETERSON. We have made available to the American people and are constantly making available to them plans for shelters. There is nothing to prevent any citizen in the United States today from taking the action which is necessary to protect himself.

Mr. HOLIFIELD. There is nothing to prevent any citizen from buying himself a machinegun or Springfield rifle, or if he has enough money, a jet plane too, to protect himself militarily, but we don't expect him to do it.

Governor PETERSON. I trust enough of us will have some type of armament as time goes on in this country. There might be an occasion when we might need it, I don't know. At any rate, there is no reason why American industry can't start to disperse. There is no reason why they cannot go underground. Except when you make suggestions of this type, you have the chamber of commerce to consider immediately in various places in the United States.

Mr. HOLIFIELD. We have them to consider when we suggest high taxes for military purposes too and for foreign aid, so let us not lay it all on the chambers of commerce.

Governor PETERSON. Not if you spend some of it in the neighborhood in which the chamber is operating. Former Secretary Talbott got into a good deal of trouble when he suggested that some of the airplane industry should be put in other places than Los Angeles and put underground. A fearsome attack was made upon him at that time. I also recall when I testified by invitation of the chairman and under threat of a subpena for the development of the upper Colorado watershed.

Mr. HOLIFIELD. You are not speaking of this chairman, of course.

Governor PETERSON. No, not this chairman. There were rather a large number of stories appeared all over southern California about how bad such a thing would be. I am suggesting that there are many things that the American people could do individually or through industry without waiting for Government.

Mr. HOLIFIELD. Or through Government leadership.

Governor PETERSON. The leadership has been offered so far; we have offered proper plans.

Mr. HOLIFIELD. The Government took the leadership in the upper Colorado and planned to spend a billion dollars for that development. That was executive leadership that brought that before the Congress and pressed for its passage. It was not the individual people.

Governor PETERSON. I would only differ in this respect. I think probably many people have spent a lifetime out in that area working

for this development. It happens that it eventually was recommended by the administration.

I think we need a combination of all these factors. The point I am trying to make is that there are many things that people can do if they are willing to pay for it and exercise some initiative on their own. If by using the words "give the people protection" we mean the development of the protective devices by the Government, then we have not done it.

There is no question about it. I think we will have to do a great deal of it.

Mr. HOLIFIELD. That is what I think, too, Governor. I am in agreement with you on that. That is one of the reasons we are holding these hearings.

Mr. Lipscomb?

Mr. LIPSCOMB. Just to clarify your position with respect to the Los Angeles Chamber of Commerce, would you like to restate your policy on dispersal and how it differs from Mr. Talbott's?

Governor PETERSON. I don't know enough about Mr. Talbott's policy. I can express myself on my policy.

Mr. LIPSCOMB. It was Mr. Talbott's policy we were objecting to. So why don't you restate your own position so you won't get into deep water?

Governor PETERSON. I got into a good deal of water on what I said about the upper Colorado watershed. It was said very carefully and properly qualified. That is beside the point. With respect to industry I would say that I would not be in favor of taking any existing industry and picking it up bodily and tearing it out of any community because you would upset the economy of the community and you would upset the tax base and that creates simply an impossible situation. But I believe sincerely that when it comes to expansions of industry that the expansion should be located in such a way as to take advantage of distance and some of them should be placed underground.

I think a perfect example of what I have in mind is one you will find acceptable. I was talking to Dr. Robert Wilson, chairman of the board of Standard Oil Company of Indiana. He served on one of the high-level continental defense committees down here some time in the last 2 or 3 years. He went back to his board of directors and said, "The expansion which we have planned for Whiting, Ind."—where they have a large establishment—"we will place out at Mandan, N. Dak., in the Williston oil basin, as a matter of offering greater security," and that is the program that they are undertaking. They did not hurt Whiting, Ind., in the sense of taking anything away from them. They did create another target and that makes it more difficult for the Russians to knock out the petroleum base of this country.

That is what I have in mind. I would not suggest that we go to Detroit or go to Michigan and pull out the entire motor industry. That would be a silly situation, but as we expand that industry or any other industry we should be giving thought to placing these things underground and placing them all over the United States regardless of what the chamber of commerce thinks about it if we are serious about survival in our country.

If Mr. Talbott said the same thing, I am in agreement with. If not, that is another matter.

Mr. LIPSCOMB. That was not his attitude exactly. That is what excited us.

Have you followed the matter closely enough to determine the attitude of California industry such as Lockheed Aircraft? They are doing what you suggested.

Governor PETERSON. I am happy to hear that. I had not followed that.

Mr. LIPSCOMB. I read recently of their expansion of a plant in Georgia and their expansion of a plant—forgive me, Mr. Chairman—in Florida.

Mr. HOLIFIELD. We will forgive you as long as we have Mr. Fascell from Florida on our committee.

Governor PETERSON. That is wonderful. The real test of whether we are serious about survival will come when American industry starts relocating its expansions, some of them underground and all of them taking advantage of distance. Bofors in Sweden, one of the great armaments factories in the world, is scattered over 25 miles on top of the earth and the sensitive parts of it are down deep in the rock.

The minute we move in that direction we will be serious about survival as a Nation.

Mr. HOLIFIELD. We had one witness, Mr. Fitzgerald of the American Machinery & Foundry Co., who testified that their company was going underground in Alabama. That is the only one who testified on that point. I am glad you brought up the fact that the governments of Europe in some instances are taking steps to protect their people by underground shelters, and if I recall correctly the government is building them. They are not requiring that the individual citizen build these shelters.

Governor PETERSON. That is true. The best example of shelter building I know of in the world is going on today in Sweden and also Norway. In the center of Stockholm is a shelter that will take 10,000 people. They can complete another one very hurriedly that will take 20,000. There will be about 5 or 6 of those in that metropolitan area which contains about 800,000 people. The one shelter they have completed, a beautiful thing that I saw just last December, will take the 10,000 people. The Swedish Government entered into a contract with an automobile dealer in the city of Stockholm and he paid them for a 35-year lease, 40 percent of the total investment made by the Swedish Government in the construction of that shelter. It is being used for sales of automobiles and storage of cars in peacetime. It is a very elaborate affair. It has living accommodations in it, feeding facilities, gas filters because they expect the Russians to use gas in the event of war.

There are some of those being built in Denmark as well as in Norway. I don't know what the Russians have done in this field. It is difficult to find out. Our information is pretty sketchy. But I know they are building public shelters in mountains at the edges of the cities.

If I may refer again to the Los Angeles area where evacuation has been in considerable disfavor and in some confusion, I have always thought that there was a tremendous opportunity for the people in

that great area to take advantage of boring into those mountains for public shelter.

How it will be financed becomes a question we may pursue here further as we go along.

Mr. HOLIFIELD. One of the factors that I want to commend you on is the fact that you are getting around to this survival study, which in my opinion is at least the prelude—I am not saying we should stand still until the survival studies are completed. I think we have enough information in Government agencies today that we don't need to stand still to evolve a program until those are finished. At least it is a recognition of the fact that regions are involved in any kind of an effective civil-defense plan and not just small political subdivisions which, of course, is where the responsibility is placed in Public Law 950.

Out of those studies I hope will come something that will be sold to the people as being practical. Take the case of Minneapolis and St. Paul. I have been informed that Minneapolis has a very good defense system but St. Paul has practically none. Yet they are just across the river from each other. It is obvious they would both be in the same target area of a nuclear weapon if one were exploded over either city. It is this sort of thing that exists in America that causes this committee a great deal of alarm.

Mrs. GRIFFITHS. Mr. Chairman, you suggested, Governor, that you would consider this country serious about survival when its industries started dispersing. You are not suggesting that this Government is so weak that it is going to wait until industry decides what to do before it takes adequate measures to protect itself and its people, are you?

Governor PETERSON. No; I don't think so. I think that the Government and industry will have to proceed together in this area. But I know of no reason why industry should wait for Government.

I have met with the steel industry in this country 2 or 3 times. It has tremendous resources, maybe in some sense greater than the Government of the United States. On a purely physical basis its balance sheet might look better than that of the Government of the United States, which does not look too good. No; I wouldn't suggest that the Government is weak. I am not suggesting that. I would suggest that both industry and Government should go hand in hand in this area.

Mrs. GRIFFITHS. But the Government could now take adequate steps to guarantee the dispersal of industry. It could either reward or punish, through its tax laws or through ordinances or through other governmental devices see to it that industry is dispersed. Could it not?

Governor PETERSON. I think that is broadly correct. It is not quite that easily accomplishable, but I think it is broadly correct.

Mrs. GRIFFITHS. I agree it is broadly correct. But isn't it really time, according to your own statements, that we begin to take those actions?

Governor PETERSON. You are right. I personally agree with you.

Mrs. GRIFFITHS. I expect to see you before the Banking and Currency Committee explaining how you do this.

Governor PETERSON. I may be there. I recall last year I was before several committees simultaneously, which was an interesting experience. I enjoyed that and was courteously received and treated. So far we have no law which permits us to move effectively in this field

of industrial dispersion. It is true that ODM has handled the program for a period of years under which it extended certain tax benefits, more rapid tax writeoffs, to people who disperse certain industrial plants. This is no criticism of ODM. I think that law was helpful in some respects, but it barely touched the problem. I don't think anybody would deny that.

Mr. HOLIFIELD. Hasn't is failed to touch the problem because the majority of the tax amortizations were granted to industry over the past 5 or 6 years not on the basis of dispersal but on other criteria?

In other words, it was not confined to dispersal; there were a great many other points in the criteria of tax amortization gifts, if you want to call it that.

Governor PETERSON. I don't think I should make any comment on it, because I don't know enough about it, Mr. Chairman.

Mr. HOLIFIELD. You spoke of these survival plans studies, and we would like to have a very complete presentation on that. And on the shelter, too. Your man, Mr. Benjamin Taylor, gave this committee a very good briefing yesterday at Battle Creek, Mich., on the shelter problem. We feel that the people ought to know what you have planned in that field and what could be done to give them a much better chance of survival, and I think the committee was heartened somewhat by the degree of security which could be brought to your urban populations by the proper type of shelter shielding. We want that given to us in a complete form.

You made the statement on that point that we have designed and tested shelters that offer effective protection even within the damaging ring of nuclear weapons. The cost is still quite high per person. But when we explored the cost of shelter we found out that in relation to the military expenditures it was surprisingly small to give protection to some 75 million to 80 million people in our urban centers, it was much less than 1 year's total appropriation for the military, for instance.

About a third of the total appropriation for the military in 1 year; yet if we are to believe your experts in that field, this type of shelter, if it were put into being, would give a protection to 75 or 80 percent of the 75 million or 80 million people in these urban centers. We will want a complete presentation on that, too.

Governor PETERSON. I would only offer this one word of caution. That these are studies and they are continuing and definitive answers are not readily available in this area.

I am sure the committee understands that from the briefing yesterday.

Mr. HOLIFIELD. Well, if I know that my family for the cost of a few hundred dollars can have the chance for survival, it is definitive enough to me to support such a plan when the alternative is complete lack of protection.

Governor PETERSON. Yes. All I am asking or suggesting is——

Mr. HOLIFIELD. I don't want to evacuate my family out in the Mojave Desert outside of Los Angeles in the summertime when it is 125° to 130° out there. I would rather take a chance in a scientifically devised shelter.

Governor PETERSON. You and I differ. I would rather be in the desert when the bomb goes off.

Mr. HOLIFIELD. I have had the job of getting from the Rose Bowl parade to my home, which is 10 miles away, and that has taken me 4 or 5 hours. I doubt if we would have that much warning time if a submarine started to shell the city with atomic shells.

Governor PETERSON. I am reminded of the time Dr. Ralph Lapp asked me a couple of years ago how close you could build a shelter to the point of detonation of a 15-million-ton bomb and live. I told him that was damn academic and he better try it himself. I wouldn't. He insisted and I thought about 5 miles, which was guesswork on my part. He used his slide rule and said, "You are wrong, it is 4 miles." The only danger is you don't know where that bomb is going to explode and the Russians might be 2 miles closer to you and then the shelter business becomes academic.

When the ICBM comes into being we have little choice except shelter.

Mr. HOLIFIELD. What is your estimate based on the best military testimony as to when that will come into existence?

Governor PETERSON. I don't know whether it is 1 year or 5 years or 10 years.

Mr. HOLIFIELD. This committee has had some testimony from the military on this point in which they think the intercontinental ballistic missile may be in existence in a very few years, and it is not too early to start preparing for it, in my opinion.

Governor PETERSON. If we could know the exact day when an ICBM would be usable that would be the date that we should forget all about evacuation except strategic and that should be the date when we should put our entire reliance on dispersal and going underground, in other words, building shelters.

I am afraid that we are approaching that date so we have to be planning and thinking and working in that direction.

Mr. HOLIFIELD. I think this committee agrees with you on that.

Governor PETERSON. As to the exact date I doubt if anyone knows that at the present time.

Mr. HOLIFIELD. You spoke of Dr. Ralph Lapp, the question of a 20-megaton bomb and a shelter within 4 miles of it. Did he also talk to you about 5½ million people getting out of Los Angeles County on 4 roads, about the chance a man would have in that kind of a case?

Governor PETERSON. No; but so far as our highways are concerned in America I don't know of any State or city that has highways that are adequate to peacetime use let alone wartime use including Los Angeles which has some fine freeways but they don't lead far enough out in the country and there are not enough of them.

Mr. HOLIFIELD. We have only 4 or 5 outlet roads from the county because of the mountains that are behind the city.

These are some of the areas we will want to explore more fully. I thought as long as we were talking about the philosophy of this, we might as well note the interest of the committee in specific testimony which we understand you are ready to give.

You have an additional statement which you want to give, and I suggest that we have a 5-minute recess at this time and then you can give that statement.

Governor PETERSON. Thank you, sir.

(Short recess.)

Mr. HOLIFIELD. The committee will be in order.

Mr. RIEHLMAN. Mr. Chairman, I had said that I would not question the Governor on his first presentation, but I do have one question I would like to ask him.

Mr. HOLIFIELD. Proceed.

Mr. RIEHLMAN. Governor, in your statement, you have said and I am sure we all agree with you that a strong Federal civil Defense is going to be and will be a strong deterrent against any aggression.

I am wondering, in your activities in the past 3 years as the head of the Federal Civil Defense Administration and dealing with the Defense Department, what the attitude of the Defense Department has been and how they have expressed it to you with respect to a strong Federal civil defense?

Governor PETERSON. I am not conscious of any opposition on the part of the Defense Department to a strong civil defense.

Mr. RIELHMAN. I am not suggesting that there has been any open opposition. I am interested in knowing what their cooperation has been and whether they are enthusiastically supporting this program.

Governor PETERSON. The cooperation has improved constantly in the 3 years I have been in this position and today is very good.

Of course, the Department of Defense has a primary mission and like everyone is mainly concerned with that primary mission and but I think the coordination and the understanding and mutual helpfulness is quite good today.

I don't think it is perfect but I think it is improving all the time.

Mr. RIEHLMAN. After one of the presentations at Battle Creek yesterday, concerning the question of the cooperation and an understanding on the part of the Department of Defense and the understanding on the part of the administration to advise the people across the Nation so they know what they can do to help themselves and what they must do to make this a strong, virile program for the defense of our people, I have come to the conclusion at least—I don't know how the rest of the members of the committee feel—that we have to have strong support from the Defense Department for civil defense.

It can't be a lukewarm approach and it can't be one of "we are willing to give what cooperation we can." The point I am driving at is this: Whether or not there is in the minds of those in the Defense Department a feeling that if they take a strong stand for Federal civil defense, it is going to affect in some way their own activities and the funds that will be allowed for the Defense Department.

I hope that is not creeping into the minds of our people in the Defense Department. I think it would be too bad and would be very effective as a deterrent to our getting the cooperation that we need from the civilians in our country to assist in this program.

Governor PETERSON. I think what you say is absolutely correct, Mr. Riehlman. I have had a feeling that when our survival studies were far enough along, or a number of them, not all of them but a number of them, we could come up with a sound civil defense program, sound for the foreseeable future, not knowing what type of a weapon may be in being tomorrow.

I am not at all certain that our scientists will be limited simply to the development of thermonuclear weapons.

I am not at all certain that we may not find some way of transmitting death by other means—I am not discussing anything secret here

because I don't know anything about it—I am just saying that I think our potential for destroying ourselves seems to be unlimited.

At the same time science and everyone else in the world seem to be very backward when it comes to developing a social consciousness and enough commonsense for men to live in peace.

I am afraid we will find superior ways of destroying ourselves above and beyond the thermonuclear weapon. I am certain it is not the final and the ultimate weapon.

It is my belief, Mr. Congressman, that some time in the next year and a half to 2 years, maybe it can be done sooner than that, I don't know, we can go before the Congress with a sound program, with price tags attached and that day it seems to me there will be a showdown in this country on whether we are serious on civil defense.

On that day when we go in with the price tag attached, civil defense is going to cost so many hundreds of millions or billions of dollars and is going to become a material factor in the fiscal considerations of the Government of the United States. It could be possible that some people in the military are looking at this as a competitive factor in the long run. But I would be doubtful. I don't think that feeling exists in any position of real responsibility in the military. If it were there, it would receive pretty short treatment from the President.

Mr. RIEHLMAN. There is another factor here. The testimony that the committee has had and the feeling that you have outlined in your statement that there is no strong civil defense and in the case of an attack on this country, the military will take care of the job anyhow, why should they take a particular stand and get enthusiastic about Federal civil defense?

That is another thing we have questioned and I think it runs through the minds of our military very strongly.

Governor PETERSON. I don't believe that in the top echelon of our military they want anything to do with operating civil defense.

Mr. RIEHLMAN. I agree with you. They say they don't but in the back of their minds they recognize off the record that they will be called on to do that job. That is what they are thinking about.

Governor PETERSON. They will be called upon to support civilian authorities to the utmost. They will be at the disposal of the President, who is commander in chief of the military forces and the Governors of the States who will be his lieutenants, carrying on responsibilities for him above and beyond their very great powers in the event of a war. I think that most men in the American military respect our civilian tradition in this country and they are not interested in injecting the military any further into the civilian aspects of our Government than it presently is.

I would not be in favor of that because there is a danger when you get into that area that someday somebody might take over by force of arms. It has happened in other countries. It has not happened here but it could happen here under the right circumstances.

Mr. RIEHLMAN. I agree that we would not want it to happen. But I think it is embedded in their minds that they will be called upon to do it and it is their feeling today that they will have to.

Governor PETERSON. The military may have had somewhat the feeling toward civil defense that I assume the New York Yankees have toward a neighborhood softball team. I don't doubt that that might have been true. But I think that they are helping their weaker

brother more comfortably and I think they will continue to as they fully appreciate the implications of the thermonuclear age.

Mr. RIEHLMAN. You have said that they are going to be called upon to assist Federal civil defense. How strong a plan for that do we have and what do we have in being today in respect to that plan? What are they going to be called upon to do?

Governor PETERSON. Well, those plans are not completely spelled out, but I can assure you that the plans are being made and have been in the process of being made for the last year or two in this area, which is totally new in the history of the United States and the world. The executive branch of the Government is planning in this area and some of that responsibility rests wtih me, some of it with Dr. Flemming, and some with Secretary Wilson.

Mr. HOLIFIELD. I think you have brought up two very important subjects which we might explore later but I would say this. I would like to know from the Governor if he believes that the Department of Defense believes that civil defense is an important factor in their ability to continue their military mission?

Governor PETERSON. Yes; I think that is true. I think when I came down here 3 years ago that was not as true as it is today. I think that was very natural and normal. There is a tendency in any line of activity for one to overemphasize his own importance in the total scheme. I think some military men may put too much reliance on their ability to retaliate for the reasons I expressed here a while ago.

Assuming that the enemy is going to strike first, he has a tremendous advantage along the lines I indicated. I think anyone who thinks in terms of the destructiveness of nuclear weapons and recognizes what a shambles an enemy could make of a large part of the United States with a relatively small number of weapons, anyone who thinks of that at all recognizes that you won't be able to move troops around the world the next morning.

The question will be whether we can live here in the United States. Survival here at home will be the most important thing. We hope that the Strategic Air Command and certain elements of the Navy and the ground forces can be in the air immediately upon the notification that the enemy is on the way and that we can be retaliating and wreaking a terrible destruction in the other country but I also believe that there will be vast elements of the military that won't be able to go anywhere the morning after the attack and will have no greater responsibility than to help the American people get on their feet. If Eisenhower is President, I am certain that is exactly what they will be doing even though some of them may not recognize that today.

Fighting men will have new responsibilities in a nuclear war, different than those they had before. We won't be marching out to battle to the sound of music. We won't be shipping out people by ships to all parts of the world. We will have the job of seeing that we have enough to eat, enough energy and enough material to continue to live.

We will have a sad, stark, miserable situation in the United States if they attack 30 or 40 military bases and 30 or 40 cities successfully.

Mr. RIEHLMAN. Mr. Chairman, I don't want to continue this any further if you don't want me to.

Mr. HOLIFIELD. Go ahead. This is as important as anything we have discussed this morning.

Mr. RIEHLMAN. In view of the fact that you do have some plans in being and you are going to expand these plans, Mr. Chairman, I would feel that the committee should ask the governor to have his staff give us information, if he possibly can, on exactly what their program and plans are. You will recall that we had a rather difficult time getting from the military any plan or program that they had for working with Federal Civil Defense other than saying they were going to cooperate and help and assist.

I don't know that you can draw a blueprint as to just exactly what they will be called upon to do because we don't know at the moment what the emergency is going to be, but I think there should be some overall program and plan and, as has been indicated, it apparently is in being or they are planning for it. To help us in our planning and our thinking as to what can best be done to be helpful I think it would be well for the committee to have that information if it would be agreeable to the Governor.

Governor PETERSON. I would suggest, Mr. Chairman, that if we are going to discuss problems that are a joint responsibility of mine and Dr. Flemming and Mr. Wilson, I would suggest that probably someday it would be appropriate if the committee met with these three individuals or their representatives to discuss planning in this broad area.

I would think primarily the responsibility here should rest on Dr. Flemming, because he is the President's staff representative in this broad area and both the Secretary of Defense and I have certain broad responsibilities.

I am perfectly willing to discuss it, but I believe it would be a more orderly approach to the matter to have the three of us come in together or if we can't all three come, our appropriate representatives.

It may even be that some of this should be discussed in executive session.

Mr. HOLIFIELD. We have had, of course, Dr. Flemming before us and we have also had the Chiefs of Staff before us, so we are somewhat acquainted with their attitude on a lot of these things.

Mr. RIEHLMAN. I will end my questioning by saying that if there is a plan, I think the committee should have it. If it is just being discussed that is another thing. If it is in the discussion stage, of course, Dr. Flemming did say that he would come back and discuss some of these matters with us after we had heard from Governor Peterson. So I would be willing to forego asking any more questions in respect to this situation until we get from the staff the plan they have. If it is just in the formative stage of discussion, there won't be anything that can be useful to us, and we will have to wait to get the other people the Governor suggested before the committee.

Governor PETERSON. Anything that is my responsibility under Public Law 920, I am perfectly willing and happy to have the opportunity to discuss before this committee and publicly.

Any responsibilities that I have by Presidential direction fall, I think, into a little bit different category, particularly where they are shared with other people and those responsibilities are the ones I am alluding to here.

There is nothing mysterious about this, but we are approaching a totally new area and I would prefer to try to approach it on that basis.

Mr. HOLIFIELD. I think it would be a fair summary if I would say that the Chiefs of Staff in their testimony before us, which I understand has been made available to you, have very strongly testified that their primary mission is a military mission and that they want to be relieved of civil-defense responsibilities, while at the same time, of course, expressing the fact that they would give such aid as they could give to civil defense in the event of an emergency. This whole field is very important because of the declaration of martial law in Operation Alert which has brought about this interest in the procedure, and I know it is very important from a psychological standpoint in the acceptance of civilian defense and the obtaining of volunteer help. If people are under the illusion that the military is going to take over, you are going to have a very hard time to get them to take responsibilities on a civilian basis, and, of course, this committee does not want to be a party to relieving the broad mass of the people from the things which they can and should do.

And we don't want to be a party to creating an impression that the military is going to do the job for them, because we just don't believe that that is going to happen.

We believe, of course, that the military will do what they can. Their testimony causes me to bring up this question with you. You are of the opinion, are you not, that the strongest possible civilian organization should be developed to do this job even though in the case of an extreme emergency they might have to operate under military orders.

Governor PETERSON. I can't conceive of us ever operating under military orders unless there is complete chaos in the United States. The military does not have, and cannot have enough people in uniform to meet this problem.

It is much bigger than the military ever will be. The military has no special experience and competence in this field. I know of nothing about being in a uniform that prepares you to become the mayor of a city, the governor of a State, a member of a State legislature, or a member of a city council.

Mr. HOLIFIELD. You would exclude the Presidency from that remark?

Governor PETERSON. I did not include it. I would exclude George Washington, too, I guess.

Mr. HOLIFIELD. You will forgive me that facetious remark.

Governor PETERSON. Certainly. I hope we have a lot of them as we go along.

Mr. HOLIFIELD. I happen to be in full agreement with you clear on up to the President.

Governor PETERSON. Well, I am certain that excepting on election day, you may be in agreement there, too. No; it would be disastrous and I think it was bad for civil defense when the impression got out that the military would take over in case of war. If that is the case, I would say let them take over today. That would be the logical thing to do. I say to you very frankly, personally I would be very happy to be relieved right this morning by Secretary Wilson if that were to be the plan.

Mr. HOLIFIELD. Unfortunately, we are going to insist that you stay in your job for a while, Governor, until we get this civil defense really working.

Governor PETERSON. I am sorry to have quite a long statement here covering a pretty broad subject and I can only cover it then somewhat sketchily but I think it is necessary then to lay the foundation on which to proceed.

At this time I am happy to report on the recent activities of the Federal Civil Defense Administration and to tell you what has been done in civil defense at the Federal level, what we are now doing, and what we propose to do in the future.

In this report I shall touch briefly on the following aspects of civil defense: Survival planning, increased Federal authority, use of existing Government agencies, delegations, attack warning, emergency operations, communications, Operation Alert 1955 and 1956, operation cue, radiological defense, public information, national organizations, civil defense abroad, research, natural disasters, survival planning.

As we are all aware, there is no precedent in United States history for defense against nuclear weapons. In planning for survival in a country as vast and highly populated as the United States obstacles of enormous complexity are encountered.

I know of no single survival plan which can be equally applicable to each metropolitan area. On the contrary, every city must develop special survival plans of its own. This is perfectly evident when we compare the distinctive characteristics and requirements of, let us say, New York City and Denver, Colo.

Not only must the plans be adapted to the distinctive characteristics of the area but they must also be flexible. A wide range of warning times and an equally wide range of weapons must be considered. We think it most probable that attack in this immediate period would come from piloted jet bombers carrying nuclear weapons in the megaton range and delivering them with considerable accuracy. Tactical warning of this sort of attack could be 2 or 3 hours for the first targets attacked.

In the future, and it may be within 5 years, the intercontinental ballistic missile could be employed against us.

The nuclear warhead could be large but the accuracy of delivery would be considerably less than that of a bomber.

Tactical warning of attack using ICBM's could be a matter of minutes. We cannot fail to anticipate that the changing nature of war may involve us in defenses against chemical, biological, and other weapons delivered by a wide variety of means.

The tactics of civil defense are necessarily complex and our greatest concern is the matter of giving adequate emphasis at any day and date to the most probable threat without being blind to the different requirements of other threats.

This consideration is part of our survival planning and of all our other planning and developmental activities.

The survival of populations likely to be the targets of thermonuclear weapons will depend upon a balanced application of evacuation and shelter.

Space and shielding are our only weapons in civil defense. The destructive effect of recently developed thermonuclear weapons is so great that it is unthinkable for people to remain near the heart of a probable thermonuclear target if there are any possible alternatives.

So, the commonsense answer appears to be evacuation, in combination with the utilization of predetermined shelter. Evacuation—to

escape blast, heat, and initial radiation. Shelter—of substantial strength outside the areas of heaviest damage for those who must remain, and lighter shelter beyond the probable target area to escape radioactive fallout, the lethal secondary effect of a thermonuclear ground explosion.

Funds to make an excellent start in the survival planning field were appropriated in the last session of Congress and are advanced by FCDA to State or local governments after individual project agreements have been approved by our national headquarters.

These studies and the additional ones on which we have firm proposals already involve areas of the country which contain more than half our total population.

In the initial phase of the survival plans, State or municipal planning officials design their study, take stock of existing community data, and conduct preliminary surveys and analyses.

This kind of orderly process is saving us both time and money. In addition, analysis of this sort has practical application to the operational plans of today.

In other words, it serves as the basis for an interim operating plan or indicates where modifications are clearly needed. We are striving for a practical payoff at each stage during the survival plan studies.

In some instances, as in Milwaukee, which I should point out has been one of the cities in the forefront of civil-defense activities generally, survival planning is on a single city basis. In many other cases, Massachusetts, Oklahoma, and Connecticut, for example, we are negotiating planning agreements on a statewide basis.

That's true, too, Mr. Chairman, in your State in California.

In a third category, we authorize joint survival planning for a whole cluster of targets. For example, New York City and the surrounding localities in New York State, northeastern New Jersey, and Connecticut comprise a target and evacuation area of such criticality as to require a joint survival plan project.

The governors of the three States involved and the mayor of New York created a joint committee to supervise the conduct of the project, and FCDA signed a contract approving the survival study.

The importance of pushing ahead on such a plan will be appreciated when we consider that the survival activities of over 14 million people are involved in this area.

While the survival plan studies are going to contribute to a great number of areas of civil-defense planning and operations, they are already having a profound influence on one organizational concept to which we and many others have given considerable emphasis.

That is the concept of metropolitan area planning. In the development of the proposals for preliminary survival plan studies, a large number of political subdivisions have had to face up to the fact that they could neither plan nor operate separately. There are many local and State legal barriers to be overcome, of course. But now that the principle itself is being recognized and accepted, we can get on with the job of reconciling the differences.

I think probably there will be a lot of differences and we may have a good deal of trouble in this area.

Mr. HOLIFIELD. Doesn't it mean, the very fact of the advent of these weapons which transcend city, county, and State boundaries, doesn't that make it an absolute necessity that we start planning on

civil defense in areas which would be affected by the explosion of these weapons?

Governor PETERSON. I certainly think so, Mr. Chairman.

Mr. HOLIFIELD. What are we going to do in the field of cooperation where an important part of a target complex refuses to do anything, either for budgetary reasons or because of lack of interest? What are we going to do in that case? What can we do under the present law?

Governor PETERSON. We can't do anything today under the present law, except to exercise persuasion which we are trying to do by every means we know how.

I think we will have to amend our law—we have three possibilities. One is to employ the compact principle. The other is to create authorities for the purpose of civil defense, on the pattern of the New York authority, involving New York, New Jersey, and Connecticut.

The other would be to amend our law to give the Administrator of Civil Defense authority to go into such areas and take whatever action is necessary whenever there is a failure on the part of any governmental subdivision to enter into this enterprise seriously and effectively.

A year ago, I asked the governors of America when they were assembled here for one of the several meetings we have conducted to brief them on enemy weapons and capabilities, the foreign situation, civil defense, and other subjects, I asked the Governor's Conference to create a committee to work with my people to try to come up with some type of governmental device that would permit us to operate in this area.

That committee has now met and they have agreed upon certain changes in the law that they think are advisable. The next thing will be to get those before the Congress in the proper manner so the Congress can act upon them.

Mr. HOLIFIELD. They have agreed upon amendments to the present law or a concept of the function of the Federal Government which does not exist?

Governor PETERSON. They have agreed on amendments to the present law that they feel would bring about the degree of authority that would be necessary on the part of the Federal Government to accomplish these objectives.

Mr. HOLIFIELD. Do they comply in general with the recommendations of the project East River?

Governor PETERSON. You mean the original project East River or the updating or both?

Mr. HOLIFIELD. The review, which was substantially the same.

Governor PETERSON. Yes. I think broadly they do and they agree with some phases of the Commission on Intergovernmental Relations report.

Mr. HOLIFIELD. You were a member of the Intergovernmental Commission?

Governor PETERSON. That is correct.

Mr. HOLIFIELD. I am pleased to see that although in most fields they did not recommend increased Federal participation, they did recognize this problem was one where Federal participation should be increased.

Governor PETERSON. It was the unanimous opinion of the 25 members of that committee that in this area the responsibilities of the National Government would have to be increased.

Mr. HOLIFIELD. You spoke of this cooperative plan of the three Governors, I believe. Was that New York-Connecticut, and New Jersey?

Governor PETERSON. Yes.

Mr. HOLIFIELD. They are the committee appointed by the governors to arrive at these studies and conclusions.

Governor PETERSON. Each governor designated his civil-defense director to represent him and that constitutes the committee under the chairmanship of the civil defense director of the city of New York acting for Mayor Wagner, and they are the committee going ahead with the studies at the present time.

We have entered into a similar agreement in the Philadelphia area which involves three States, too—New Jersey, Pennsylvania, and Delaware.

Mr. HOLIFIELD. Have their studies arrived at the point where they are willing or ready to make any kind of a public report?

Governor PETERSON. No. As a matter of fact, we are trying to encourage these people to move more rapidly. I want to suggest, however, that under our law and under our traditions in America, we can't force this thing.

We have to try to lead it. As a matter of fact, I know of no way that you can force any mayor or governor, I know of no authority that can force them in this country.

Mr. HOLIFIELD. This tri-State group is a different group from the governors' conference group, isn't it?

Governor PETERSON. Yes, it is.

Mr. HOLIFIELD. This would be an experiment in three States trying to compose their differences and for mutual protection agreeing on one master plan for civilian defense in their area.

Governor PETERSON. Yes. This may be worthy of your time. When we met in Philadelphia, there was assembled in the council chambers under the leadership of former Mayor Joseph Clark, of Philadelphia, 3 governors, representatives of 11 counties and 39 cities, and Federal representatives, both regional and national, all assembled in 1 room to discuss at one time the problem of the survival of the metropolitan area of Philadelphia.

I assume that there never has been such a meeting before in the history of the United States. That is one reason why I think that it is important that we pay some little attention in these hearings to our national disaster experiences, because in your State of California, I recall a meeting the day after Christmas in Governor Knight's hearing room that was participated in by all the responsible officials in the State of California that had anything to do with disaster relief, the city officials, county officials, all of the Federal regional representatives, including the military and those of us who came out of Washington, including a number of Congressmen and California's Senators and those of us representing the executive branch all assembled in 1 room to discuss how to meet 1 problem.

That again, I think, was a unique meeting in the history of the United States.

Some people who want quick and doctrinaire solutions to these things have a tendency to overlook the significance of these meetings in the field of political activities and human relations. This is a much more difficult field than any other I know of in the world, including the upper reaches of mathematical studies or scientific conjecture or philosophical debates. How to work with human beings is the most difficult of all undertakings, and we are making some progress.

I don't think it is anywhere near fast enough.

Mr. HOLIFIELD. At the same time I think you will agree with me that we can't let the safety of these great target complexes rest on completely voluntary participation, if we are going to have any chance for the continuity of the lives or the industrial production in these areas.

Governor PETERSON. A significant element of any survival plan is testing. We are urging all cities to participate in tests as they develop their survival plans. Only through testing will the authorities work the kinks out of their plans, and only through testing will the individual citizen begin to comprehend his planned role in an emergency.

Like any good community plan, survival planning takes brains, teamwork, time, and money. I am happy to say that, with the exception of time, the country possesses these elements in abundance.

Of course, we have to be thrifty with both time and money, but we believe the economical use of our assets will pay off with the production of a very satisfactory combination of survival plans.

One of the most important products of the evidence gained from the survival studies will be an ability to price out an even more fully balanced program for a solid national civil defense.

I have here copies of our present printed guidance on the survival plans, M 27–1, which is the Survival Plan Manual, and M 27–2, which is the Survival Plan Workbook.

I submit them to you at this time rather than lengthen my remarks on this most important subject.

(The documents referred to are in the files of the subcommittee.)

Mr. HOLIFIELD. Since time is getting short, we will save our questions.

Can you be with us Thursday morning?

Governor PETERSON. Yes.

Mr. HOLIFIELD. Then we will save our questions for Thursday morning and let you go ahead with your statement.

INCREASED FEDERAL AUTHORITY

Governor PETERSON. Since the passage of the Federal Civil Defense Act of 1950 the power of the weapons against which we must build a civil defense has increased perhaps a thousandfold.

The stockpiles of such weapons have also grown. As I have indicated in public statements during the past year, I am convinced that greater Federal authority and responsibility are now in order.

A similar view is held by many groups and individuals who have given considerable attention to the problem of effective civil-defense preparedness. The National Planning Association and the Commission on Intergovernmental Relations have urged greater Federal responsibility.

The 1955 Review of Project East River stated:

The technique of utilizing metropolitan target zones for planning and operations in nonmilitary defense will require a material increase in the Federal Government's leadership, authority, responsibility, and operational control of nonmilitary defense while retaining the essential elements of State and local participation and responsibility.

As you well know under Public Law 920, 81st Congress, we recommend, advise, and suggest to the States; we do not order nor do we direct. When the act was first passed this was probably enough but today it is not.

I am familiar, of course, Mr. Chairman, with your statements on this subject.

One of the most, if not the most, important factors in the development of effective civil defense is training and education.

We will need about 150,000 trained civil-defense leaders in order to assure that we will have competent personnel to assume command and control functions in our survival efforts.

We need a trained cadre of 10 to 15 million volunteers to man the technical services organizations, and we need to give some training to the entire general public to insure that the people will be prepared to act intelligently and appropriately in an emergency situation.

FCDA has outlined plans for the accomplishment of this extensive training program, but to date the results of our efforts have reached little more than the token level.

If we are to achieve even minimal success in the training area—and I use minimal to mean the lowest possible numbers of trained personnel required to make our planning really operational—we are going to need both better control and support of training and education activities in the States and their political subdivisions.

There are many statutory forms which could be applied to civil defense ranging from the present law to a far extreme of a Federal civil-defense corps with the Federal Government exercising direction and control over even the local units.

We in FCDA have been studying this problem intensively for many months.

My staff has made certain recommendations to me for a legislative program as well as certain major administrative changes which can be made without statutory revisions.

These recommendations appear to have promise of achieving the Federal coordination and direction required by the present threat.

The proposals to which I refer are briefly the following:

1. Authority to exercise greater control over the civil-defense activities of the States and their political subdivisions through the increase in Federal grant-in-aid type assistance to include contributions toward personnel and administrative expenses.

2. Authority to exercise greater control over civil-defense activities related to metropolitan complexes which include more than one State through joint State commissions or authorities.

3. Incorporation in national programs—such as the construction of roads, schools, hospitals, public buildings, and defense facilities—of a specific requirement that civil-defense measures be observed with respect to provision of shelter, location, protective construction, communications, and emergency use.

4. Establishment and maintenance by the Federal Government of a nationwide system for monitoring and reporting radiological fallout.

5. Emergency military assistance to civil defense in an attack, comparable to assistance in disaster relief in peacetime. Preparation to include.

(*a*) The training of regular forces, reservists, and National Guard troops in support of civil defense as a task within the military mission.

(*b*) The orientation of training of Reserves toward the civil-defense support task as well as specific civil-defense assignments for individuals and some units based upon preattack arrangements. Among obvious exceptions would be such units as the Air National Guard and antiaircraft units, since they have an immediate military mission for defense or retaliation.

6. The establishment of a new agency of Government responsible for all elements of nonmiltary defense including civil defense.

We have recently assumed responsibility under delegation from the Director, Office of Defense Mobilization, for the programs of reduction or urban vulnerability and the continuity of essential functions of State and local governments.

These are necessary parts of a total civil-defense program and contribute to an increase in the Federal role. With regard to the other program changes described above, I anticipate that I will receive considerable guidance from the survival studies which I discussed above.

As we move through initial phases of the survival studies in many of our metropolitan complexes, we shall be gathering the basic information against which to test the practicability and feasibility of these recommendations.

I will then be in a position to propose to the President valid legislative and executive changes.

When the Congress appropriated funds for survival planning in the last session it had a right to expect that FCDA would adjust its plans and programs as it gained new knowledge from these practical studies.

Certain of the recommendations of my staff have substantial implications both with regard to Federal expenditures and Federal-State relationships.

I regard it essential that we weigh these and analyze them as part of the survival planning program.

USE OF EXISTING GOVERNMENT AGENCIES

It has long been my conviction that civil defense to be adequate and workable should be thoroughly woven into our way of life.

It is my point here that it should not be necessary for civil defense to be crying alarm.

Rather, the necessity for civil defense should be so apparent that every citizen can know that when the alert is sounded, civil defense will be in a position to proceed competently into action.

Every public servant, whether city or county, State or Federal, should have an emergency civil defense assignment and have been trained in the performance of that duty.

72796—56—pt. 4——11

For many—like the fire, police, and medical services—it will be continuing to do, under the most adverse circumstance, those things which the individual public servant is paid to do normally.

For many others, it will be adapting skills and abilities to do quite a different job.

DELEGATIONS

On the Federal level, one of the basic tenets of civil defense is that the FCDA will make maximum use of the existing resources of other Federal agencies.

This we do, under Public Law 920 and with the approval of the President, through an extensive delegation program.

Our purpose is to take advantage of the competence of existing Government departments and agencies. We seek to utilize their technical know-how, their long-established channels of communications, their well-defined areas of responsibility, their extensive experience at their own jobs, their skilled personnel, and their invaluable prestige in the community.

The President of the United States has approved the delegation of 33 specific civil-defense activities to 7 departments and agencies of the Federal Government.

These important measures concerning research, planning, use of resources, and emergency operations are designed to build into the Federal Government all phases of civil defense.

In the broadest terms let me cite some examples:

The Secretary of Health, Education, and Welfare is responsible for planning, guidance, and action concerning biological and chemical warfare against humans; the radiological effects of weapons; financial or other aid to people in want due to enemy attack; protection of foods and drugs against contamination; and civil defense education in the schools.

I want to say right here that the Department of Health, Education, and Welfare has taken this delegation with utmost seriousness and has done an exceedingly fine job and with very limited funds.

Possibly we will discuss the funds situation at a later time.

The Secretary of Agriculture is responsible for combating biological and chemical warfare against animals or crops, preventing and controling enemy-caused fires in rural areas, and maintaining adequate emergency food supplies for attacked or support areas.

The Secretary of Commerce is responsible for designation, use, coordination, and emergency clearance and restoration of highway and street systems, emergency traffic control, and for developing a system whereby the pattern or radiological fallout may be forecast.

Here again the Weather Bureau has done and is doing a splendid job along with certain other elements.

The Secretary of Labor is responsible for the development of a plan to meet civil-defense manpower needs during a civil-defense emergency.

The Attorney General is responsible for the protection of penal institutions and the control and use of prisoners and facilities during a civil-defense emergency.

The Housing and Home Finance Administrator is responsible for protective standards for new housing construction and temporary shelter in existing housing, planning for the provision of temporary

emergency housing in support of enemy-attacked areas, and emergency restoration of essential housing and related facilities.

The Secretary of the Interior is responsible for the development of a national plan for assuring the availability during an emergency, of fuel and electric power for civil defense purposes.

This effort aimed at maximum use of Federal agencies takes much time, patience, and hard work.

Such a program is difficult to develop, but it is practical, realistic, and it will work when needed.

In order to make certain that the conduct of civil defense activities by other departments and agencies be provided appropriate leadership and coordination, the Civil Defense Coordinating Board, of which I am the Chairman, has met frequently since it was established by the President last May 11 for the purpose of bringing together senior representatives of the agencies to whom we have made delegations and of stimulating and coordinating the integration of civil defense into the structures of the Federal Government.

I offer for the record Executive Order 10611 whereby last May 11 the President established the Civil Defense Coordinating Board. This lists the membership of the Board and sets forth its duties.

(The document referred to is as follows:)

EXECUTIVE ORDER 10611

ESTABLISHING THE CIVIL DEFENSE COORDINATING BOARD AND DEFINING ITS DUTIES

By virtue of the authority vested in me by the Federal Civil Defense Act of 1950 (64 Stat. 1245), and as President of the United States, it is ordered as follows:

1. There is hereby established a Civil Defense Coordinating Board, hereinafter referred to as the Board, within the executive branch of the Government. The Board shall be composed of the Administrator of the Federal Civil Defense Administration, who shall be the Chairman of the Board, and seventeen other members, one of whom shall be designated by and represent each of the following-named officials, respectively:

The heads of the ten executive departments, the Chairmen of the Atomic Energy Commission and Federal Power Commission, the Directors of the Office of Defense Mobilization and the Bureau of the Budget, and the Administrators of the Housing and Home Finance Agency, the General Services Administration, and the Veterans' Administration.

2. The functions of the Board shall be:

(a) To assist in the development of an orderly, integrated plan for the participation of all Federal departments and agencies in the civil defense of the Nation, taking into consideration other defense requirements, both economic and military.

(b) To make recommendations to the President regarding specific arrangements involving the assumption of certain civil-defense responsibilities by the various departments and agencies.

(c) To facilitate the development and implementation of such arrangements with the Department of Defense and the Office of Defense Mobilization.

(d) To advise the President from time to time with respect to the progress of the integration of civil-defense activities into the various departments and agencies of the Government.

3. The Board shall meet with the President at his request, and shall meet at such other times as may be determined by its Chairman.

DWIGHT D. EISENHOWER.

THE WHITE HOUSE, *May 11, 1955.*

Governor PETERSON. In addition to the formal meetings of the Civil Defense Coordinating Board, there have been numerous conferences and discussions between my staff and appropriate staffs of the delegate agencies to speed organization of activity.

Recently we have taken the delegation program to the field through workshop conferences in our regions.

To date, such 2-day meetings have been held in all of our 7 regions and with participation by all the delegate agencies with the FCDA regional and headquarters representatives.

This is an important step toward attainment of truly operational delegate agency programs.

But let me take a specific example of delegation activity from an area of civil defense preparedness which has become very critical since the thermonuclear tests in the Pacific increased our awareness of the dangers of radioactive fallout.

I have delegated the responsibility for providing a daily national fallout forecast to the Department of Commerce.

The forecast program was begun by the Weather Bureau of that Department in June 1955, and was expanded in February 1956 to include all of the United States as well as Alaska and Hawaii.

Based upon wind data up to 80,000 feet by elevation, the forecasting service utilizes information from 52 radar-wind observatories.

The forecasts are transmitted by teletype to about 500 military and Weather Bureau installations from which they are disseminated on request to State and local civil defense offices for the preparation of fallout plots.

As an additional contribution to the program, the Weather Bureau has assigned experienced operations meteorologists to the FCDA national and regional offices on a fulltime basis.

We are also negotiating with Canada to develop a combined fallout forecast program.

ATTACK WARNING

The Air Force is responsible for detecting the approach of enemy aircraft, identifying, tracking, and intercepting them. The FCDA has the responsibility for disseminating warnings of attack to the civilian population.

The FCDA operates the civil air defense warning system (known as the CADW) for dissemination of the warnings to 200 key point warning centers throughout the United States. These key points, manned by State or local civil defense personnel, are responsible for alerting local civil defense headquarters in their areas. Local officials in turn sound the appropriate warning for the public.

The warning is initially received from the Air Force by the FCDA attack warning officers who are located at each of the 16 Air Defense control centers or by the FCDA liaison officers at Continental Air Defense Command in Colorado Springs. Liaison officers are also maintained at the headquarters of the three Air Forces—eastern, central and western. During 1955, staffing of the attack warning officer positions was increased to allow coverage by FCDA personnel on a 24-hour basis.

Within the past few months, we have installed the national warning control system (called NAWAC), for intercommunication of warning and tactical information. This is accomplished through full-period telephone circuits connecting the FCDA attack warning officers, liaison officers at CONAD and at the three Air Force headquarters, FCDA regional offices, the national headquarters at Battle Creek, and my office.

During the past year, changes in the telephone circuits of the CADW and relocation of key points have decreased the time necessary to transmit the warning nationally to all key points and receive individual acknowledgment to less than 8 minutes. In individual air divisions the fanout and acknowledgment takes under 2 minutes.

No warning is of real use unless it actually reaches the American people within time for them to take necessary protective action. With our matching funds program we have been helping to build up the warning system within the States and cities. These consist of sirens and horns. About $7.8 million in Federal funds have been invested in this part of the program and about $10 million in State and local funds.

We are now vigorously carrying on a program of research into internal warning devices to develop a foolproof, inexpensive appliance which will warn people in their homes or places of work, day or night. Contracts have been let with leading electronic manufacturers. Voice warning devices to explain the situation, particularly along evacuation routes, are also being studied.

EMERGENCY OPERATIONS

We sometimes emphasize our civil-defense preparations without mentioning our important function of actual operations in an emergency. Should an attack come, FCDA, which has been the planning and guiding agency, must be ready to carry out important emergency functions. We must maintain a constant flow of information to the President and all elements of Government as to the true nature of the situation. We must assess damage and casualties and coordinate Federal aid.

In order to carry out these functions, we have an up-to-date emergency plan. Our Washington staff moves in the event of an emergency to a relocation site (code name Highpoint) located outside of Washington. We share this location with other Government agencies.

Our national headquarters at Battle Creek has its own emergency operations center. This center, known as Lowpoint, can communicate with Highpoint, the seven FCDA regional offices, the attack warning officers and liaison officers at the Conad installations, and with other Federal agencies. Members of the FCDA staff have emergency assignments at that center. There the emergency situation is analyzed. Summaries and communiques are forwarded to Highpoint and instructions from Highpoint are carried out. Each of our regional offices has an operations center which is activated under emergency conditions.

Our ability to carry out these emergency functions has been steadily increasing. Operation Alert 1955 was an excellent training situation as well as an opportunity to review our readiness.

We have continuing training courses to fit employees for emergency jobs. Our Battle Creek location has helped us considerably in this regard. The national headquarters is already dispersed from either a critical target area or a target area.

Our emergency control center can be fully operational during business hours in a matter of minutes and, because of the relatively short distances between the homes of most of our employees and the headquarters, can be fully staffed during off-duty hours in a very brief

time. We do, of course, have a 24-hour-a-day duty officer and communications watch.

Sufficient flexibility has been achieved in our operational planning that the FCDA can carry on through a line of succession of regional centers even if both Highpoint and Lowpoint should be knocked out.

COMMUNICATIONS

A moment ago, I mentioned that the data for determining fallout plots are disseminated by the Weather Bureau by means of teletype. I should like to add that FCDA has established a national communications system with equipment at our national headquarters in Battle Creek, at Highpoint (the emergency relocation center near Washington, D. C.), and at all regional and State offices. We can communicate with the regions and States both by voice and teletypewriter through virtually any telephone switchboard in the country. This would permit us to bypass damaged areas.

This system has great flexibility. We know of no other Government communication system that is less vulnerable.

FCDA has emergency radio communications between Battle Creek and Washington emergency relocation site. In addition we have at the headquarters in Battle Creek a transmitter operating on the amateur frequency bands. We have also requested funds to provide emergency radio facilities from our headquarters to our regional offices and from there to the States.

FCDA makes matching funds available for communications facilities with the State, but the emphasis is upon the maximum use of existing commercial and amateur communications facilities with particular emphasis on integrating such facilities into organized civil-defense communications plans. This program has been making very satisfactory progress.

For example: I may cite that the organized civil-defense radio amateur participation has increased 100 percent during the past year, advancing from a total of approximately 200 approved civil-defense plans to well over 400 at the present time, involving an estimated 15,000 radio amateurs actively engaged in civil-defense communications.

Out matching funds for State and local communications, including the establishment of fixed control centers and mobile communications vehicles, will reach about $16 million by June 30. Obligations to date for this purpose have exceeded $11.5 million.

OPERATION ALERT

We are presently scheduling another nationwide alert to take place from July 20 to 26. The alert last year afforded the opportunity for the profitable examination of our plans and operations. It also pointed up a good many deficiencies. Some of these we could reasonably expect to encounter under disaster conditions.

The exercise clearly exposed the Nation's unreadiness to cope adequately with a thermonuclear attack.

Nevertheless, I believe Operation Alert 1955 was successful as a means of improving civil-defense effectiveness at all levels, including the Federal level.

At this time, I wish to submit to the chairman a separate written report on Operation Alert 1955.

(The statement referred to appears in the appendix, exhibit 5.)

While the purpose of a nationwide alert is to afford an opportunity for civil-defense training and to appraise our progress and efficiency, we are not unappreciative of the fact that such exercises increase public awareness of civil-defense preparedness.

The President and officials of the executive branch participated in the last alert and proceeded to their emergency relocation sites. I would be gratified if this year Members of the Congress and the judiciary undertook to participate in Operation Alert 1956. I believe that this would provide an excellent opportunity to study the civil-defense problem and to set a praiseworthy example for the American people.

OPERATION CUE

In May of last year Operation Cue provided us with much valuable technical information concerning blast, heat, and radiation effects with which we have been able to begin the indoctrination of additional civil-defense personnel. The objectives of the observer program generally were met. Those who were able to remain through the postponements—about 500 of the original 1,300 people—generally seemed to think it was worthwhile.

In addition, a television audience of upward of 100 million people witnessed the atomic explosion that occurred during Operation Cue in Nevada. This demonstration of atomic power brought vast numbers of Americans face to face with the enormity of the survival problem in the nuclear age.

The field exercise teams that had specific assignments did a wonderful job. We couldn't have run the program without the police teams, warden teams, and others that had definite jobs to do. The mass feeding team performed under very difficult circumstances and demonstrated techniques that would be invaluable in mass feeding under real emergency conditions.

There were perhaps three major impressions gained from the technical tests:

First, industrial equipment proved to be much more blast resistant than we had expected. The general conclusion is that utilities and communications may be expected to be usable without major replacement of facilities within the C and D damage zones.

Second, residences can be made more resistant by proper design and reinforcing.

Third, shelters can provide excellent protection at a reasonable unit cost.

Different categories of food were exposed, under as many conditions as possible, from direct blast and thermal effects to fallout. There was also a test of several kinds of packaging.

A major part of the food-exposure program consisted of laboratory evaluation which is still in process. Preliminary conclusions from the food tests indicate clearly that food outside the area of complete destruction may be safely eaten, provided the container is intact—glass fragments could be a hazard in foods with soft packaging. Within the area of major destruction, foods could be eaten, if neces-

sary, after the first day or so simply because the hazard of starvation might under some circumstances be greater than the radiation hazard.

Beverages would be important—it can be assumed that any bottled beverage in an intact container may be used.

Shelters of several different types were tested with generally satisfactory results. A bathroom shelter constructed of 8-inch monolithic concrete, which was designed for blast resistance, escaped damage but the frame rambler in which it was located was completely demolished. Occupants in this type of shelter would have been safe from blast and missiles at this pressure range. The mass of the walls and ceiling would also have shielded them from moderately high levels of radioactivity.

Basement shelters in all houses would have protected occupants from the amount of debris resulting from damage to the house. The fact that the shelters were below ground level would have meant a high degree of protection against fallout.

The above-ground shelters performed very well when tested against overpressures of the order which may be expected outside of the zone of complete destruction from a nuclear weapon. It must be emphasized that these shelters would have to be earth-covered or surrounded by sandbags in order to provide radiation protection in areas of very high intensity.

The underground basement exit-type shelters were a disappointment in the higher pressure ranges due to failure of doors and entryways.

These shelters would be expected to provide good protection in the low-pressure range or in a higher pressure range with improved blast doors.

The 50-man personnel shelters were tested at 1,059 feet from ground zero. The device detonated had an estimated yield of about 35 kilotons. For these values the occupants would have been provided complete protection from blast, thermal heat, and gamma radiation. This test was of particular importance since it means that for special cases we are able to provide a high degree of protection at a reasonable cost.

The most significant finding from the utilities test may be summed up in the preliminary conclusion that any distance where structures survive a nuclear explosion, utilities may be expected to be usable with simple repairs.

Standard civilian communications equipment proved to be much more resistant than we had expected. Few of the many units of communications equipment sustained serious damage. The conclusion is that communications equipment would be usable with moderate or no repair in areas where buildings remain standing even though damaged.

We confirmed the high potential for operating flexibility and efficiency that exists in the Civil Air Patrol. Their communications networks, for example, are a potential resource with which civil-defense directors should become acquainted.

Operation Cue, of course, could not have been possible without the genuinely cooperative spirit of the Atomic Energy Commission. Within their statutory limitations, they have been most helpful and I should like, at this time, to record my appreciation for their efforts in easing the labors of the FCDA. The most recent evidence of this has been their assistance on invitations to the forthcoming tests in the

Pacific. Certainly after these hearings, a number of civil-defense personnel will be flying west to see with their own eyes the power of modern weapons and to learn more about defenses against them.

RADIOLOGICAL DEFENSE

Our radiological defense program has been intensified during 1955. We have established a separate Radiological Defense Division to carry forward this program, which was formerly assigned to the Health Protection Division.

Civil-defense requirements for radiological monitoring necessitated development of instruments capable of measuring extremely high radiation levels. Such instruments have been developed and the capacity of industry to produce them is expanding.

We have stepped up procurement of radiological survey meters and dosimeters to be stockpiled for emergency operation. We now have some 62,000 survey meters on order, in addition to over 28,000 already delivered, and have contracted for 123,500 dosimeters over and above the 95,000 previously procured. Instruments have been available to the States on loan for training purposes since the summer of 1954 and to date 35 States and the District of Columbia have taken advantage of this opportunity. In addition 10 other States have procured instruments under our matching funds program. Altogether, the States have themselves ordered more than 5,400 survey meters and 7,000 dosimeters under the Federal contributions program.

Concurrent with the procurement of instruments, a program is underway to train civil-defense workers to use them. The entire staff of our national headquarters has received such training. Training programs have been established in many States and cities, supported by Federal funds under the contributions program. To date about 19,000 civil-defense workers have been trained as radiological monitors and monitor leaders. In addition, about 400 individuals have received further training to enable them to evaluate the findings of the monitors as a basis for civil-defense operational decisions.

With the cooperation of the Public Health Service, Department of Health, Education, and Welfare, FCDA conducts courses at our national headquarters at which qualified individuals are trained as radiological defense instructors. Persons who complete these courses are also able to evaluate the findings of radiological monitors.

In order to improve operational capability in radiological defense we are underway on a research program with the University of California which, it is anticipated, will result in a system permitting rapid assessment of radiological hazards resulting from an attack with high-yield nuclear weapons, and immediate application of the most effective measures to minimize their effects. This research is being coordinated with the work of the Weather Bureau in forecasting fallout as well as research undertaken by the Atomic Energy Commission. Public Health Service, and the Department of Defense in various aspects of nuclear radiation.

The National Bureau of Standards, Department of Commerce, has assisted us in evaluating and testing our radiological instruments. They are also cooperating by studying various kinds of structures such as dwellings, department store buildings, schoolhouses, and office buildings to develop more definitive information with regard to the

protection these kinds of structures may provide against radioactive fallout.

There is increasing coordination with the Atomic Energy Commission on radiological problems. In October, a 2-day meeting was held in Chicago at which representatives of the Commission gave a classified briefing to key staff members of our agency on various aspects of radiation and research developments. I have arranged with Chairman Strauss to have members of the Atomic Energy Commission staff spend considerable time at our Battle Creek headquarters in insuring continuing liaison. This is in addition to our regular close liaison in Washington.

In addition, the Atomic Energy Commission conducted an exercise at the Nevada test site in October for the Federal Civil Defense Administration. In this exercise, they demonstrated for Federal, State, and local radiological personnel the aerial monitoring system which has been developed for monitoring weapons tests both in Nevada and in the Pacific. Instruments used in this system were prototypes. After modification and production engineering similar instruments will be available for civil defense use.

PUBLIC INFORMATION

FCDA has embarked upon a program designed to foster in all citizens a more complete understanding of the nuclear threat, the consequent personal need for effective civil defense measures and the progress which the Government is making toward assuring our survival as a nation.

Our education program represents a serious effort to weave organized preparedness into the American way of life without regard to the ups and downs of international relations. When radioactive fallout was recognized as a significant dimension of nuclear warfare, the necessity of teaching every American the fundamentals of survival became all the more urgent.

As one means of accomplishing its responsibilities, FCDA has issued millions of copies of general-use booklets on the fundamentals of survival and other important aspects of civil defense. In 1955 we printed 59 million copies, of which we had distributed about 43 million by the end of the year. This effort was 10 times our 1954 production. Of course, we also distribute many technical manuals, bulletins, and handbooks for use by civil defense workers in the regional and State organizations.

I have been particularly encouraged by the unprecedented civil defense coverage in 1955 provided by newspapers and magazines, and by the motion-picture, television, and radio industries.

FCDA joined with the Air Force and the Federal Communications Commission to issue special service awards to the 1,300 radio stations which have invested more than $2 million and an uncounted number of enginering man-hours to keep operative the CONELRAD emergency broadcasting frequencies—640 and 1240 kilocycles.

The Mutual Broadcasting System has recently undertaken an important series of weekly civil defense programs as a public service for us and for State and local civil defense.

More than 80 articles on civil defense appear during the year in leading popular magazines, and hundreds of excellent studies on vari-

ous aspects of the civil defense problem appeared in the Nation's professional journals. I believe it goes without saying that not all of this attention to civil defense was self-generated.

Perhaps this is a good time to acknowledge the strong support we have received from the entertainment world with stars donating their time to record for radio a series of civil defense messages.

Private business organizations and associations have set a generous example by contributing to the national civil defense effort. The Institute of Life Insurance, the Burroughs Adding Machine Co., the Chrysler Corp., the American Trucking Association, and the National Automobile Dealers Association all have sponsored the production of civil defense motion pictures. In addition, hundreds of television stations cooperated with us by showing FCDA films such as A New Look at the H-Bomb.

The interest in civil-defense exhibits also reflects the growing public awareness of civil defense. Over 3 million people saw FCDA exhibits at State and county fairs and at business, professional, and fraternal meetings in 1955.

Our Grandma's Pantry exhibit succeeded in making good commonsense to women everywhere. This display stresses the idea that every home should maintain a 7-day emergency supply of food and water. We have produced 1,000 of these graphic presentations and the Sears, Roebuck Co. alone has taken 500 for use as store exhibits.

TRAINING

The objective of our information efforts has been to promote awareness of the nuclear threat and of the rudiments of civil defense: Personal awareness, family awareness, group awareness, and community awareness. We shall surely continue to promote public awareness, but our next objective is to move on from awareness to action—to motivate greatly increased participation by individuals and groups in some form of civil-defense preparatory activity.

We recognize that mass education has its limitations and that the citizens who will be best prepared for survival after a disaster will be those who have participated personally in civil-defense training courses.

If we are to have the required numbers of trained workers I mentioned earlier, we need the three major components that make up an effective and comprehensive training program:

(1) An overall plan for the accomplishment of the training;
(2) A training organization to carry out the training plan; and
(3) Instructional facilities required to support the program.

1. Planning. My staff has developed fairly comprehensive plans for the conduct of required training for the three major segments of our population: Namely, civil-defense leaders, organized civil-defense volunteers, and the remainder of the general public. Even our planning efforts, however, are sometimes seriously impaired because we are not able to control or direct the planning and conduct of civil-defense training carried on by the States and their political subdivisions. It is recognized that there has been considerable civil-defense training carried on in some of the States and in many of their larger communities. Some of this training is very good, some of it probably is not too effective. But without some degree of control over these activities

at State and local levels, it has been impossible to standardize or to fit these training activities into an overall national training plan to insure that we are all making a systematic approach to our common objectives.

2. Organization. Our planning incorporates recommendations for a training organization necessary to carry out uniform and standardized training at all levels and in the various political subdivisions. We have the nucleus of a training organization in the agency represented by the Training and Education Office in national headquarters and the regional training and education officers assigned to each of the seven regions. There is serious need for the extension of this training organization into the States and their major political subdivisions, either by the assignment of additional FCDA personnel or through grants-in-aid to assist in the support of State and city employees so assigned.

3. Facilities. Our program to provide instructional facilities to States and their subdivisions operates in two broad areas. The first area is the development of standardized instructional materials for each of the civil-defense skills training courses. We are developing what we call teaching packages for each course. These packages include instructors' guides, lesson plans, and suggested visual aids. We have developed these standardized course materials for 8 of the prescribed training courses, and by the end of fiscal year 1956 we will have completed 15, or approximately one-half of the number presently required. These instructional materials are either new or completely revised, and reflect the latest information available on the great destructive power of thermonuclear weapons.

The second broad area of assistance is in the training and educational part of the contributions program which enables the States to receive Federal reimbursement for up to one-half of the amount expended on approved CD training courses. During fiscal year 1955 considerable progress was made in liberalizing the provisions of the contributions program in support of training, including matching funds for training or test exercises, and costs of construction or remodeling training centers. During calendar 1955 approximately $450,000 of Federal funds were matched by States for such training courses.

4. Training and education office. I mentioned three population groups who need civil-defense training: Civil-defense leaders, organized civil-defense volunteers, and the remaining general public. We have naturally directed our major efforts toward training the leadership group. We operate an excellent Staff College at the National Headquarters in Battle Creek. During 1955 we had more than 950 graduates of the regular and special short courses presented by the Staff College faculty. Most of the graduates of these orientation-type courses were city, county, and State leaders or members of the armed services.

In addition, the Staff College has formed a traveling team which brought civil-defense leadership instruction to eight States during the past year or so.

With a view to strengthening their civil-defense training program, 15 other States have indicated interest in contracting for the services of the traveling team.

However, even with the increasing interest on the part of the States, and with the States operating followup courses, we estimate that the

present rate will require nearly 13 years to give 1 of 3 short courses to the 150,000 civil-defense leaders we believe will be needed to insure efficient operation of our civil-defense organizations.

Therefore, although we believe that we are doing much in this area, our efforts need to be intensified.

NATIONAL ORGANIZATIONS

I feel that FCDA was especially successful last year in attracting the good will, cooperation, and financial participation of many organizations and individuals with great influence on American public opinion. The American Legion, to cite an outstanding example, sent 3 special civil-defense newsletters to its 3 million members, and the Legion has formed hundreds of rescue teams to assist local civil-defense directors in time of disaster.

Women's organizations have made a major contribution to the dissemination of knowledge about civil defense. Working with their accustomed thoroughness and enthusiasm in adult associations and youth groups, women trained themselves in every kind of civil-defense acitivity, with particular emphasis on programs pertaining to the home and family survival techniques. Nearly 140 women attended Operation Cue and participated in the atomic test. Seventy delegates of the American Legion Auxiliary attended a special FCDA training course at our school in Maryland. In January 1955, we began on a modest scale the publication of a newsletter entitled "By, For, and About Women in Civil Defense." Five hundred copies of the first edition were mailed to national women's organizations. By the end of the year, the monthly circulation had grown 12,000.

The Boy Scouts of America have closely identified themselves with civil defense. Great numbers of Boy Scouts are volunteers in the Ground Observer Corps, while many others are participating in rescue training or communications programs.

Our relations with the American National Red Cross have continued to be excellent. We work very closely both in natural disaster and in planning against war disasters. In fact, operational arrangements have recently been greatly strengthened through the full-time assignment of experienced Red Cross personnel to our regional offices and at national headquarters.

Labor organizations have from the very start of civil defense been most cooperative. I am happy to say that the very first convention of the combined American Federation of Labor and Congress of Industrial Organizations voted full support of civil defense last December.

I offer for the record a copy of their resolution which was adopted unanimously.

(The resolution referred to is as follows:)

CIVIL DEFENSE

Committee Secretary Soderstrom read the resolution on civil defense as follows:

Organized labor has supported civil defense from its very beginning in 1940. In the planning and programing of civil-defense procedure, representatives of organized labor have been consulted. Representatives of organized labor have been called upon to help plan the protection of civilians and the restoration of industries and service facilities that may be destroyed or interrupted.

Since 1951 organized labor has expressed its official support of civil defense through a Labor Advisory Committee to the Federal Civil Defense Administration which is a committee broadly representative of organized labor. Meetings have been held from time to time with the Civil Defense Administrator for the purpose of expressing the position of organized labor on the problems of civil defense and its effect on the membership of organized labor.

Organized labor has long taken the position that civil defense is a Federal Government responsibility in exactly the same way as military defense. Organized labor believes that the Federal Government must take the leadership in civil defense if we are to avoid chaos in the event of war. Changes in the Civil Defense Public Law 920 are necessary in order to bring this about.

The development of nuclear weapons since 1950 makes this change absolutely necessary. The area of destruction possible with nuclear weapons is such that recognized geographic lines or political subdivisions cannot be recognized or defenses set up on such outmoded procedures. Organized workers who work in plants and live in critical target areas cannot be regulated on the basis of State, county, or city lines. Leadership in developing civil-defense programs for such industrial areas must of necessity come from plans developed by Federal Government authorities based on a knowledge of an enemy's ability to penetrate into such areas.

Organized labor has offered its resources and manpower to assist in the development of an adequate civil defense program. Organized labor insists that the civil-defense program which it regards now as a nationwide survival program must be based on the American concept of equal partnership and equal responsibility for all who share equal danger: Now, therefore, be it

Resolved, The reality of the situation and the grim dangers we face make it mandatory that the first convention of the united labor movement under the banner of the AFL–CIO call upon the Congress of the United States to pass a new civil-defense act which will provide that:

1. The primary responsibility for civil defense rests with the Federal Government in the same manner as provided in the United States Constitution for the common defense of the Nation.

2. The Federal Government be responsible for giving direction, service and financial assistance to the States, counties and communities for developing civil-defense plans in line with the Federal responsibility.

3. The Congress through the proper committees authorize and appropriate sufficient funds for these purposes.

4. Congress authorize the Civil Defense Administrator to set up minimum standards of civil defense preparation and facilities to maintain them, such standards to be maintained subject to Civil Defense inspection in order to qualify for Federal aid in any respect.

5. Congress be directed to provide proper protection, wages, and terms of employment, and workmen's compensation for civil-defense workers who may be required to work or train in civil-defense procedures prior to or after an attack on any community.

6. Civil-defense regional boundaries be revised to meet the reality of the Nation's critical target area and fallout potential as a result of the use of nuclear weapons.

7. Direction of the civil-defense programs will not be abandoned or delegated to the armed forces in the event of martial law or enemy attack.

We believe that a civil defense program if approached and developed in this manner would solve the apathy that seems to prevail at this time on matters pertaining to civil defense.

CIVIL DEFENSE ABROAD

In November and December, I had the opportunity of participating in a lively exchange of views with our allies when I attended the NATO Civil Defense Committee meeting in Paris. I took advantage of my presence in Europe to see first-hand the civil-defense measures which are being taken by countries whose people have vivid memories of World War II.

I also visited Sweden, which was neutral in World War II and is not a member of NATO. Sweden, however, with its deep caverns

and Government-financed shelter program, in my opinion, has made as good civil-defense preparations as any nation in Europe.

Members of my staff and I have visited countries abroad on a number of occasions to study their civil defense. We have been graciously received by their civil-defense leaders. They have shared their experiences and their experiments with us. In turn, many civil-defense officials of other countries visit us. We hope they have enjoyed being here and that we have been helpful to them. This exchange of information is an activity we expect to continue since we all have so much to learn about civil defense against modern weapons.

RESEARCH

When the Congress last spring approved our request for supplementary appropriations, we were enabled for the first time to establish an effective research program. Out of our total budget we set aside something over $2 million for this effort which is apart from, but carefully coordinated with, the survival studies previously mentioned. These funds have enabled us to make a good start on a backlog of urgent research problems which had accumulated because we lacked the money in previous years to undertake them.

Research programs have been initiated in a number of important areas. To mention a few: Work has been started to provide the basis for a national radiological defense system; we are attempting through research to improve our methods and capabilities of warning and communicating with the public; and we are continuing a program on a bomb damage assessment and reporting system for national planning purposes. Other programs deal with improved shelter construction, control, and extinguishing of mass fires, medical problems, and human behavior.

Our research programs are carried out through contracts with many leading universities, industrial organizations, research institutes, and through arrangements with other Government agencies but is designed to take full advantage of their work, and, when necessary to get some of the answers we need, we have provided them with funds. For example, the Weather Bureau has undertaken a climatological study of fallout probabilities, the National Bureau of Standards has started some special work on ionizing radiation, and we have arranged for the Department of Health, Education, and Welfare to provide important answers on the treatment of radiation injury.

NATURAL DISASTERS

I could hardly bring my prepared statement to a close without referring to the frightful natural disasters that struck the Eastern States in August and October and the Far West in December. Since Executive Order 10427 assigns me the responsibility for coordinating the disaster relief activities of all Federal agencies, I made on-the-scene inspections of the flooded areas in the Northeast last summer and on Christmas Day flew to the areas of destruction in Nevada and California.

Civil defense has helped to combat major natural disasters since 1953, but in 1955 we faced our biggest challenges since the Agency was founded.

Our operations were better organized and more effective than at any time in the past. We knew our job better, our assignments to other Federal agencies worked more smoothly, coordination with the Red Cross was excellent, and we got operational results faster—despite the fact that we suffered from the necessity of having too few people do too much for too long. Nevertheless, through these experiences our ability to provide speedy assistance has improved.

I cannot help being impressed by the spirit and enterprise of the untrained volunteers who invariably are willing to try to help their unfortunate neighbors in time of disaster. The volunteer spirit, however, is not always enough. We've had repeated demonstrations of the need for some civil defense training for everyone in order to sustain an emergency rehabilitation effort.

The training program has led to greater civil defense efficiency in the disaster areas. At the same time, the experiences we have gained in disaster relief would be applicable to civil defense activities in the period after an emergency attack.

As you can see, I am proud of FCDA's record, and particularly of the progress we have made since my last appearance before the Congress.

I have touched rather briefly on a great many civil defense matters. I shall now be happy to attempt to answer in greater detail any questions the subcommittee may have.

Mr. HOLIFIELD. Thank you, Governor Peterson.

We will now adjourn until Thursday morning.

(Whereupon at 12:25 p. m. a recess was taken until 10 a. m., Thursday, April 19, 1956.)

Governor PETERSON. No. The dome-type shelter has come to light to us within the last 60 days. This is a new thing. This whole business of building shelters to withstand thermonuclear blast is a new area of activity.

Mr. HOLIFIELD. It has been over 3 years now, almost 4 years since the first nuclear device was exploded in the South Pacific, and it will be 3 years this coming midsummer, this coming August, I believe, since the Soviets have exploded a thermonuclear device, and yet there has been no contract let for even an experimental type of shelter, except some that you have tested at Nevada. Are we to understand, then, that we wasted our time in looking for an hour and a half at this presentation and we are going to waste our time again this afternoon looking at the shelter presentation? Is it discarded now in your mind, Mr. Peterson?

Governor PETERSON. No; it is not discarded in my mind. You are the best judge of whether you are wasting your time in this afternoon's presentation because you saw the one the other day and you requested it this afternoon. If there is any doubt in your mind, I suggest you do not have it this afternoon.

Mr. HOLIFIELD. We are giving you the chance to put everything on the public record that you have done and everything you are willing to come up with and advocate in a tangible way.

Governor PETERSON. We will submit a shelter program when we are satisfied in our minds that we have the soundest possible program, with the most accurate costing of that program possible to put before the Congress. I say that I would come with no other kind of a program because of the very sad experience of the Federal Civil Defense Administration in its submission of programs in 1951, 1952, and 1953 when it received very short shrift before the Appropriations Committee, a program, which as far as I know on that day was sound, and on that day the Appropriations Committee had no qualifications to judge it to be unsound.

Mr. HOLIFIELD. We will go into the matter of whether it was sound or not and we will also go into the matter of whether your presentation this afternoon is sound or not. That is something that is a matter of judgment, one way or the other.

The point is: you haven't come up with a program in 4 years' time for shelters for the American people, and they are either daily in the hazard of a surprise attack or they are not. If they are not in danger of a nuclear war attack, then we are wasting 35 billion on our defense program.

If we are in danger of it, we have a gap in our total defense that needs to be closed.

Governor PETERSON. I think we do have a gap in our total defense.

Mr. HOLIFIELD. It is your responsibility as Administrator to bring before this committee and before the Congress at a time of your choosing, I admit, some type of a workable program, and yet nothing has been brought before us.

Governor PETERSON. There have been many programs brought before the Congress and many things we have asked for before the Appropriations Committee that we have been denied. Small requests for research funds and many other things. I am not going to argue that Congress may not have been right in some circumstances.

That would be a foolish attitude on my part. The men on the Appropriations Committee are men of good will and decent men and patriotic men. We will go before the Appropriations Committee at the appropriate time to request funds. This is not the committee to come before to request funds.

Mr. HOLIFIELD. That is true. We know we are not the Appropriations Committee.

Mrs. GRIFFITHS. In that connection why haven't you been before the Banking and Currency Committee asking for a change in the law in which we would back up these loans on housing. That hasn't anything to do with funds. Why haven't you ever done that?

Governor PETERSON. We attempt, of course, through the Civil Defense Coordinating Committee to discuss these matters within the administration and we attempt to exercise leadership and to secure action through that group with these other agencies of the Government. I think we are making some progress there. I certainly must admit that we haven't come up with the type of program that you suggest, Mrs. Griffiths.

Mrs. GRIFFITHS. Who is dragging his feet? Why don't they do something?

Governor PETERSON. That is a question that is pretty difficult to answer when you are dealing with government, all branches of government. There might be a good many people in America who would not share your enthusiasm and mine for the type of program which we are discussing. I personally am in favor of the construction of shelters and would like to see the Government do everything it can to stimulate it.

Mrs. GRIFFITHS. Couldn't you have urged this on your own as a Civil Defense Director?

Governor PETERSON. I can urge it anywhere within the Government. I cannot order it of course.

Mrs. GRIFFITHS. Why did not you do that?

Governor PETERSON. I think we have urged it in conversations with the agencies involved.

Mrs. GRIFFITHS. Why not try Congress?

Governor PETERSON. I cannot order the Administrator of the Housing and House Finance Administration. I obviously cannot order the Administrator of that agency to proceed.

Mrs. GRIFFITHS. That is right. And he couldn't have done it anyhow. Why not try Congress? Why not try to amend the law?

Governor PETERSON. Well, there are many ways to go at that, and one way is for the Administration to try to do it. Another way would be for a Member of the Congress to try to do it. As I understand it, either route is proper and is usual.

Mr. HOLIFIELD. You know very well, Governor Peterson, that unless a program comes up from the executive department with the approval of the Bureau of the Budget, that a lone Member of Congress putting in a bill, as a rule, has very little chance to get it through. The initiative is usually taken by the executive branch. The Department of Defense does not come up and ask us to formulate their budget for jet planes and guided missiles and that sort of thing. In accepting this responsibility, I am willing to take my part as a Congressman, and this is one of the things this committee is trying to do, trying to discharge its responsibility in this set of hearings.

I call your attention to the fact that you asked for $10 million for research in last year's budget and I understand that about $9 million of them have been assigned to survival planning, but you have $2,089,000 which you assigned to research in your own budget, and I notice you have under the item of shelter $16,500 allocated. Then I note further that in the delegation of urban vulnerability responsibility by either the ODM or the FCDA, or possibly both—I have never been able to delineate exactly where one's responsibility begins and the other's ends—we note that the HHFA was given a delegation conducting research and providing technical guidance to the States concerning protective standards for new housing construction and temporary shelter in existing housing facilities. They testified that they have only $25,000 allocated from this fund of yours and that is enough to hire 1 man and 2 assistants, and they have done nothing about it, so that delegation apparently is a diffusion of responsibilities rather than a delegation for the purpose of implementation.

Governor PETERSON. No, Mr. Chairman. A year ago we asked the Congress of the United States for approximately $3 million for the delegate agencies, the agencies to whom we made delegations. The House gave us not 1 dime. The Senate restored some of that money and in the conference room came out with $1,500,000 to carry out the work of all our delegate agencies. In other words, the Congress of the United States wrote its determination of what it thought of the delegation program in terms of dollars. That is one example.

Mr. HOLIFIELD. How do you expect them to appropriate money for a shelter program when you don't come up with a program.

Governor PETERSON. I am not talking about a shelter program. I am talking about the delegation program.

Mr. HOLIFIELD. That is one of the items.

Governor PETERSON. We have conducted shelter research in the past. That is about the only research work we have done in the past years.

Mr. HOLIFIELD. Dr. Bowman of the AEC was before us and he said that:

I just introduced by reference up to 100 studies that had been made in the field.

That was in the field of shelter.

And I said:

Have enough studies been made for us to get on with the program or are several years more studies needed?

Dr. Bowman said:

I think that the studies which will still be made will modify the program, but I think we have enough studies so we can make a start.

I said:

That includes the area of providing reasonable shelters and providing protection against radiation and decontamination and all the things that are necessary to have a reasonable and adequate civil-defense program within the bounds of the peril that we are facing?

And he says:

It does.

I asked him:

So you would advise, then, as a man of professional background in this field that we get on with the job of protecting the people, would you?

And he answered:

I think it is necessary that something be done to protect the people.

Governor PETERSON. I would only say that AEC—AEC's research has been more for military purposes and has been done on military-type structures. We have done what research has been done, and it has been small in terms of research done for military purposes. We have done the research in the field of civilian-type shelters. We have spent relatively small amounts of money in that field over the years. One of my requests before the Congress has been constantly for money for research in the field of civil defense. The world spends billions of dollars to build better instruments to bring about death and destruction.

The record is open. We have called it to the attention of the Appropriations Committee of the Congress. We had great difficulty in getting any money for research in the field of civil defense. I don't know the total figure, but last year we got $2 million. That is the most money we have ever had in 1 year, and in other years the figure has been well under a million dollars and in some years just a handful of money. I join with you, Mr. Chairman, in suggesting that the neglect in the field of civil defense has been shameful, but I suggest that some of the responsibility must rest on the Congress of the United States.

Mr. HOLIFIELD. I accept that statement as being a fair statement.

Governor PETERSON. If there is any area in civil defense to which we have not called attention and given a thought to, which we have not alerted the American people, both within and without the Government, I am unaware of it.

Mr. HOLIFIELD. You have alerted and scared them to death. You have told 5 million people out at Los Angeles to get out of that city on the 4 roads that go into the desert, and you haven't told them what to do when they get there. You have done a good job of alerting them, but you have not, in my opinion, nor has any other civil-defense administrator, done a job of bringing forward practical programs which the people could use. This shelter study is just one of the examples of it. I have here one of your own studies, a study made by the Institute for Social Research at the University of Michigan, and table 7–1 on page 110 shows that on the questions such as this, "If you heard some Sunday that an atom-bomb attack had started on the United States, what would you do? Stay where you are? Go somewhere else?" Eight percent of the population said they would leave town. Eighty-eight percent said they would remain in town. Three said "No," and one "not ascertained." Five percent would attempt to leave by car. That shows that the people have no confidence in evacuation. They have not been provided with a workable plan in their opinion. Maybe they are wrong. But if 88 percent of your population remained in town under such conditions, it seems to me it is time to get on with the shelter program, even if it is not a perfect program.

Governor PETERSON. With respect to evacuation, we made the only study in this field made in the world. We made it in Milwaukee. It is a careful study. I assume you are familiar with it. It has been made available to your committee. I would suggest further that there have been about 40 tests of evacuation in the United States. Every one has been successful. All of the evidence indicates that evacuation is a valid concept. The Los Angeles situation is a special situation.

I would suggest to you that there is not unanimity about the matter even in Los Angeles. There are many people in Los Angeles County who believe you can evacuate Los Angeles. It is true that the mayor of the city does not believe so. It is true that one of the newspapers out there does not believe so. It is true that there is a good deal of noise and confusion in that area. That does not necessarily prove that you cannot evacuate Los Angeles. Anyone who wants to can take any attitude he wants to about evacuation as far as I am concerned. All the evidence I say up to this point indicates it is a workable concept until the ICBM comes into play.

If the chairman can name the date that the ICBM comes into play, then I am willing to name the date that evacuation as a concept becomes seriously impaired and will need to be discarded.

Mr. HOLIFIELD. I cannot name the date but I will accept the prediction you made that it will be within 5 to 7 years. I will accept that and say it is time to start planning for that. When that day comes your evacuation studies will become pretty obsolete, and if we are going to have any kind of protection for the people, it will have to be in the nature of some type of shelter, even though it be an inadequate type of shelter for a 100 percent guarantee of survival. There will be a 50 or 60 or 80 percent chance for survival. It will be worth the expenditures, in my opinion.

Mrs. GRIFFITHS. I believe you state that every person in the United States has been alerted to this danger. As a matter of fact, have you or any of your staff addressed the State legislatures of this country?

Governor PETERSON. I have addressed some of them; yes.

Mrs. GRIFFITHS. But not all of them?

Governor PETERSON. Not all of them. I want to say this. We have called into Washington I think on three different occasions all of the governors of America for the specific purpose of alerting them with respect to enemy weapons and capabilities and the foreign situation and other related problems, including civil defense. We have done the same thing with all the mayors of America on three occasions. I think we have done a reasonably good job of alerting the people.

Certainly it is not a perfect job. I think a reasonable job.

Mr. HOLIFIELD. I would think personally that you should discuss this with the State legislative bodies. But I would like to ask you, then, on this alerting of the mayors, do you know how many of the incorporated towns and villages of this country have warning signals? Is that within your province?

Governor PETERSON. That is within my province. We are matching money with the cities to install such warning devices and the cities where they are needed. They are not needed in cities unless they appear to be targets. In the cities in which they are needed, we have somewhere in the neighborhood of 80 percent of the cities now.

Mr. MILLER. I am Alfred P. Miller, Acting Deputy Assistant Administrator, Operational Control Services.

Governor, 230 cities of 50,000 or over have warning systems that by our standards are adequate. The other 25 or 30 have partial systems and we are doing everything possible to get those installed. A good percentage of the money is going into suburban areas and smaller towns for warning systems. Thus the trend has changed. When the program first started we put high priority on the critical and target

cities and made it mandatory that the funds go into those areas. Today our program is such that we are putting high emphasis on warning. Unless warning is complete, no other contribution funds can go to any other program with the exception of public education. If they have no adequate warning system in the principal cities, we withhold funds for any other civil-defense program unless they bring that warning up to where it should be.

Mrs. GRIFFITHS. Do you have any means of making these people install warning systems.

Governor PETERSON. No; we do not, Mrs. Griffiths, other than as Mr. Miller suggested, we refuse to make contributions to them until and unless they have carried out their responsibilities in this warning field.

Mrs. GRIFFITHS. Do you think it would be advisable that you have such means? It is the first requisite, isn't it?

Governor PETERSON. Yes; I would say we are doing pretty well in this field. I think we have——

Mrs. GRIFFITHS. Eighty percent of the people after 6 years—I don't think you are doing well.

Mr. MILLER. Eighty-five percent is complete. The program is proceeding satisfactorily.

Mrs. GRIFFITHS. At the end of 6 years 85 percent of the principal cities and mostly the suburban communities around the principal cities.

Governor PETERSON. We have done that on a voluntary basis and on a basis of persuasion. We haven't been able to order that.

Mrs. GRIFFITHS. I don't think that is doing very well.

Mr. HOLIFIELD. Do you have any doubt that you have the authority under your act to install Federal warnings systems? The testimony of Dr. Miller was that it was the key to additional help. Is it beyond the province of the Federal Defense Act of 1950 for you to spend money for warnings in these areas?

Governor PETERSON. I think we could spend the money there. That would assume that we had the money. But we started this program on a basis of the States matching 50–50 in the installation of these devices. I think New York State had actually spent considerable money before we got into the act. We did not reimburse them. That was one of the things we were asked to do, reimburse them for the money they had spent, but we have simply picked the tab up 50–50 since the day we got into this field. I don't think the job is as good as it needs to be, Mrs. Griffiths. I do think, however, that 85 percent is a pretty marked accomplishment in this area. We are trying to close that 15 percent gap as rapidly as we can.

Mrs. GRIFFITHS. You estimate that in 7 years you may have an intercontinental missile. If it took you 6 years to get warning in 85 percent of the major cities and nothing in cities under 50,000, how can you possibly anticipate that at this rate we will ever have any civil defense that will give any type of protection?

Governor PETERSON. We can get a civil defense within I year if the American people accepted the seriousness of the situation and the necessity for action, and by the American people I include all elements of Government likewise.

In other words, this country could do tremendous things in a relatively short period of time if we entered upon a crash program. The

fact of the matter is that most people don't believe there is going to be a war. Some people are fatalistic. They think it will be so horrible that you can't do anything about it. There are other psychological reasons that I can discuss with you.

Mrs. GRIFFITHS. A lot of people don't think it is ever going to come to them.

Governor PETERSON. That is right.

Mrs. GRIFFITHS. They don't understand that they will die from the radioactivity in the air.

Governor PETERSON. When I say we can build a strong civil defense in a year, I think I should amend that to say everything except the accomplishment of the building of all the shelters necessary in a year. I doubt if we can do that in a year. We can do everything else and do it pretty fast. We could build a tremendous number of shelters in that period of time if the will and the money were there.

Mr. HOLIFIELD. I was informed yesterday—and I was shocked by the information—that the California State legislature has repealed the Federal Civil Defense Act and withdrawn their appropriations for contributions to the Federal program and have passed a law which sets up their own California disaster plan. Have you been informed of that?

Governor PETERSON. No. I am not familiar with that as an accomplished fact. I did sit in a meeting in California called by Governor Knight, I believe a year ago, in which these matters were discussed. There was a feeling on the part of some of the people in California that they had already done more than their share in relationship to the Federal Government's share in building civil defense. I think that some of them felt that they had moved out ahead of the parade so far that they were justified in diminishing their activity. I couldn't agree with that, but that was the attitude of some members of the State legislature.

Mr. HOLIFIELD. If California is a forward State in their planning, as is New York and possibly Wisconsin—I believe they are the three top States, are they not, in this field of civil-defense planning?

Governor PETERSON. I don't know that I want to say that. I want to say that California ranks right at the very top, as do New York and other States.

Mr. HOLIFIELD. If they are pulling out of the program, it is evidence of one of two things, either the legislature and the people who are in charge of this program in California feel they have had inadequate service from the FCDA or they are making a very bad mistake. I am not passing judgment on which is the case. I was informed of this yesterday. I haven't had time to investigate it. We intend to go into this when we go to California.

Governor PETERSON. I think they are making a mistake in any event. While California put a lot of money in civil defense under the inspired leadership of Governor Warren, I think California has the wealth and the ability, even if it has in fact put somewhat more than its share into it, and I would say the responsibility to its people, and the problem is such that they should continue to do it. I would have to disagree with the people who take this action only to that extent. It is true that California has done an excellent job. In fact, it leads the Nation in the investigation of problems of radioactivity and the means

to defend against the effects of radioactivity. California has done an excellent job.

Mr. HOLIFIELD. I am not saying this from the standpoint of California patriotism but in relation to what has been done to what is needed to be done, I think they have failed out there in their responsibility just like some of the rest of us have failed. I know of no one that is satisfied.

I have the downtown section of the city of Los Angeles in my district, and I have talked to the Federal civil defense director of Los Angeles, Colonel Lynch. I have talked to Mayor Poulson, and I have talked to the mayor and director of civil defense in my own suburban city 10 miles out, by the name of Montebello, and I have talked to other officials in other cities in this great metropolitan complex, and I find no satisfaction anywhere with the civil-defense structure which they have. They cannot even begin to say that they are in a position to protect their people, and this is one of the reasons why I am alarmed.

We have also, from people out there in the State, letters which indicate the inadequacy and the lack of advice from the Federal standpoint, the lack of planning and the lack of implementation and other points, and, of course, this is one of the things that we are concerned about.

Governor PETERSON. I think that the criticism that ordinarily comes in places of that kind is about the lack of Federal dollars. I think the desire, on the part of many people, is for the Federal Government to finance this entire program. The law is not written in this manner, and I doubt if you could pass a bill like that through the Congress of the United States. I would be willing to wager a little on it.

Mrs. GRIFFITHS. Are you opposed to it?

Governor PETERSON. To the Federal Government financing the entire program?

Mrs. GRIFFITHS. Yes.

Governor PETERSON. Yes, indeed.

Mrs. GRIFFITHS. Are you opposed to the Federal Government financing the entire war effort, or do you think it ought to be done by the States?

Governor PETERSON. No; the Constitution of the United States is perfectly clear with respect to the defense of the United States and if the Congress of the United States sees fit to define the defense to include civil defense and to include the assumption of complete responsibility in this field, I would abide by it.

Mrs. GRIFFITHS. Do you think civil defense is something less than the war effort?

Governor PETERSON. No, as a matter of fact I think we reached the point as I indicated in my testimony here the first thing on Tuesday, I think we have reached the point where if we don't improve our passive defenses, we can lose the war. I think I spoke quite clearly on that the other day.

Mr. HOLIFIELD. This is the point. You admit it is a vital part of our total defense posture and yet apparently you fail to go ahead and say that if dollars are needed for jet planes, dollars are also needed to protect the lives of the people that are making them in the Los Angeles Basin, in Kansas City and in other places.

Governor PETERSON. I don't think I fail at all excepting to solve a problem immediately upon its realization by some people, and I am perfectly willing——

Mr. HOLIFIELD. If you talk out of both sides of your mouth—and I don't mean any disrespect——

Governor PETERSON. I don't talk out of both sides of my mouth at any time.

Mr. HOLIFIELD. I don't mean any disrespect when I say that. You say in one breath that catastrophe can hit our urban centers and destroy them by surprise attack and you say it is a vital part of the total defense of our Nation and then you say on the other hand it is not a financial responsibility of the Federal Government. I can't understand that. If that isn't talking out of both sides of your mouth, please explain.

Governor PETERSON. No, sir, that is not talking out of both sides of my mouth. I said the present law——

Mr. HOLIFIELD. You have not asked that the present law be changed and you are the Administrator charged with the program.

Governor PETERSON. That is correct. I will ask for such changes advisable in the law at the time I choose to ask for them and through the proper channels of the Government.

Mr. HOLIFIELD. How many years is that going to be?

Governor PETERSON. Judging by an expression of 1 or 2 Democratic members of the Appropriations Committee when this subject was up for discussion of who should finance and be responsible for this program, I think it might be an eternity before this is done.

Mr. HOLIFIELD. Now that you have brought partisan politics into this, what did the Republican members of the Appropriations Committee say to your request and how did they vote on your request?

Governor PETERSON. Well, now we would have to get special requests.

Mr. HOLIFIELD. You are the one that brought the matter up now. We are trying to keep this committee out of partisanship. We are accepting the responsibility mutually as Republicans and Democrats on this committee to get an operating civilian defense.

Governor PETERSON. Is there anything partisan about——

Mr. HOLIFIELD. I made no attack upon the Republican administration. I have included in my remarks criticism of the Democratic administration.

Governor PETERSON. Is there any attack or partisanship indicated in referring to a man's party? Is there anything bad about that?

Mr. HOLIFIELD. Why did you say Democratic members of the Appropriations Committee?

Governor PETERSON. Because they happen to be Democratic members.

Mr. HOLIFIELD. Are there Republicans on that committee?

Governor PETERSON. Yes.

Mr. HOLIFIELD. Let's put both sides on the record. What were their statements?

Governor PETERSON. I don't know that they discussed this particular problem.

Mr. HOLIFIELD. Civilian defense. You mean to say that the Republicans on the committee were not concerned with civilian defense?

Governor PETERSON. You are jumping too fast. Let's pitch one ball at a time.

Mr. HOLIFIELD. I am pitching the same ball we started with.

Governor PETERSON. I am talking about the expansion of the responsibility of the Federal Government in the financing field, assuming more financial responsibility for civil defense. I said to you that on one occasion in discussing this matter before the Appropriations Committee, Democratic members of the House indicated to me they would be unalterably opposed to the Federal Government's taking any further responsibilities in the field of civil defense. That is not an attack on anybody or smearing anybody or besmirching anybody. I made a factual statement on the part of a great American who happens to be a Democrat.

I didn't think there was anything wrong in referring to a man as a Republican or Democrat. If there is, I would like to be advised of it.

Mr. HOLIFIELD. This is the first time you divided the Appropriations Committee into Democrats and Republicans.

It might be interesting for the record to know what the Republican attitude was.

Governor PETERSON. I am certain that there would have been many Republicans opposed to extending the sphere of Federal grants.

Mr. HOLIFIELD. Let's get on with this hearing without any further partisanship.

Governor PETERSON. I refuse to acknowledge that there has been any partisanship about that.

Mr. HOLIFIELD. The record stands. You may proceed with your statement, sir.

Governor PETERSON. On the specifics of State and local activity, I should like to present to the subcommittee two kinds of indexes. The first kind is statistical. The second is more of a sampling of examples.

The subcommittee already has, I believe, copies of our annual and interim statistical reports. These cover such facts as interstate compacts, use of civil defense forces in natural disasters, and the details of the contributions program. I just submit these, if I may, for the record.

Mr. HOLIFIELD. They will be received.

Governor PETERSON. A second index is the expenditure of money. I should like to submit for the record a report recently completed for us by the Bureau of the Census which shows the States and cities that have invested some $28 million of their own funds in civil defense in the past year.

Mr. HOLIFIELD. Without reference to these particular requests the material that you wish to present will be accepted throughout your presentation and the subcommittee will determine that part which is pertinent to the record in its entirety or partially.

It will all be received as part of our files and determination will be made only in the interest of the brevity of the printed record as to where it should be placed. With that understanding, we will receive anything that you wish to give us.

Governor PETERSON. Thank you. This is the index of the expenditures made by the States and I submit that.

LIMITATIONS

Flying helicopters close to fires introduces hazards not ordinarily encountered by helicopter pilots—particularly when the flying must be done under mountain weather and altitude conditions. Special training will thus be necessary for pilots flying helitanker units.

Water or other fire-extinguishing liquids delivered by helicopter will of necessity be limited. For this reason, nozzlemen skilled in the art of using small amounts of water efficiently [2] are essential to the practical application of the helitanker.

[2] Water versus Fire, A. G. Neuns. California forest and range experiment station. Forest Service, U. S. Department of Agriculture, 1950.

EXHIBIT 3

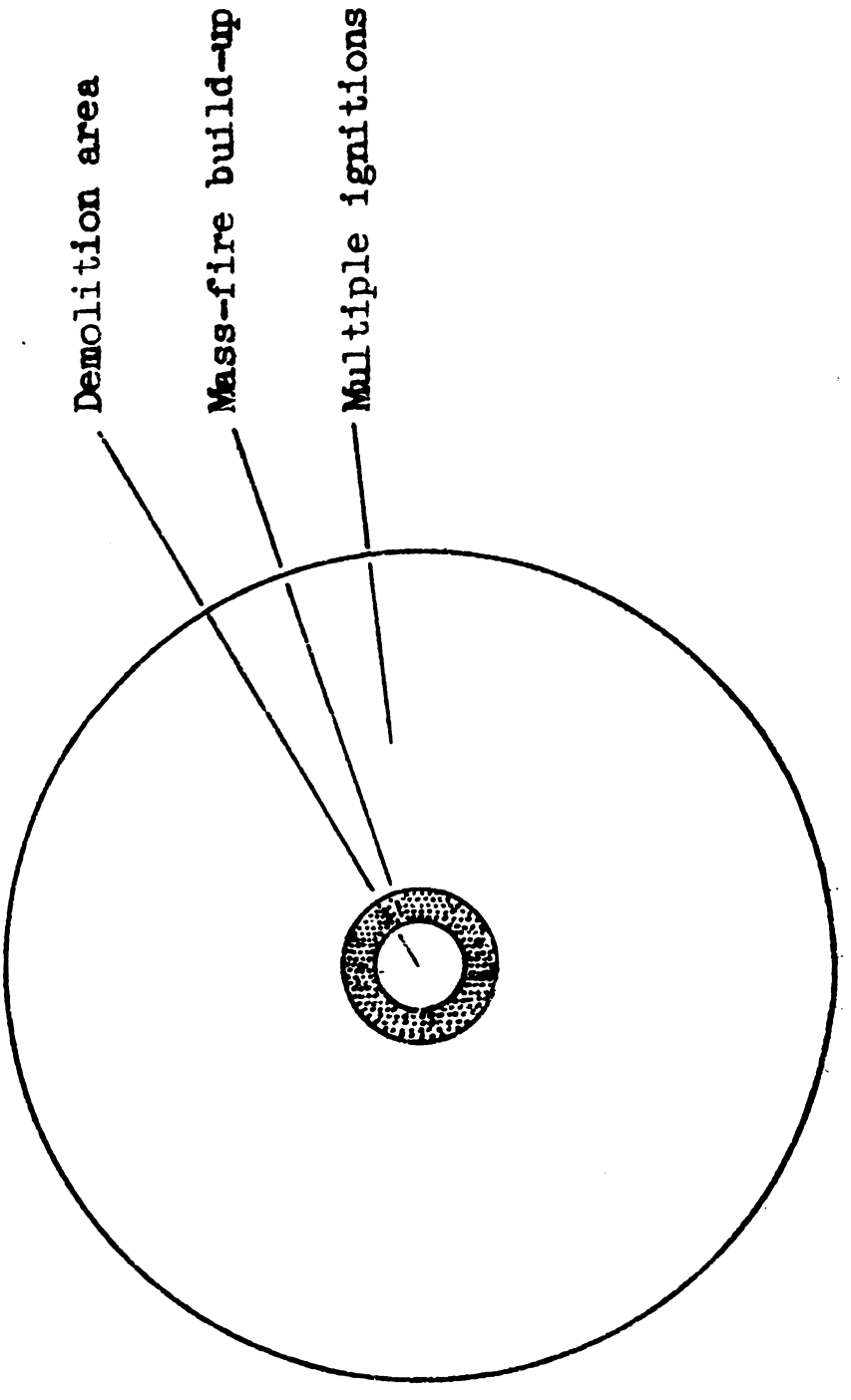
COMBATING FIRE STORMS AND CONFLAGRATIONS—A PRELIMINARY ANALYSIS OF RESEARCH NEEDS

Division of Fire Research, Forest Service, United States Department of Agriculture

SECTION II. A PRELIMINARY ANALYSIS OF RESEARCH NEEDS

PROBLEM ANALYSIS

Intense mass fires may be started by saturation bombings with incendiaries and by atomic bomb explosions. Either may be wholly devastating. The immediate result of an atomic bomb detonation, for example, is a central area of demolition with intense mass fires building up around its perimeter. Outside the demolition area is a much larger zone of multiple ignitions and minor blast damage which decrease in intensity with distance from target center. These distances increase with size of bomb, and with newer types of bombs they may even be many times larger than experienced at Nagasaki and Hiroshima.



What damage can we expect now?

With present state of readiness or even with conditions similar to those in Japan and Germany in World War II, the area of total destruction by mass fire from either saturation raids or atomic explosions will largely be smaller than the entire multiple ignition zone. With severe burning conditions, conflagrations will run beyond the zone of initial ignitions until stopped by the absence of fuel.

Five groups of activities must be coordinated into a unified action program if a significant reduction in enemy-induced mass-fire damage is to be achieved. This preliminary study delineates these five activities, describes jobs to be done in connection with each activity, and gives some examples and research goals.[1]

1. Treat kindling fuels.—Fire storms arise because there are multiple ignitions in kindling fuels over large areas. Kindling fuel treatment aims to reduce the number of kindling points below that conducive to large fire development.

2. Prepare barriers.—Fire barriers take the form of open areas, fire-resistant structures, water-spray curtains, and areas of low-fuel density. Preparation involves inventory and planned use of existing barriers, and development of others where analysis and experience dictate need.

3. Predict fire behavior.—A prediction system makes it possible for fire services to vary the state of preparedness with day-to-day changes: (1) In relative difficulty of controlling small fires; (2) In probability that fire storms or conflagrations will occur with a given pattern of small fires; (3) In behavior of fire storms and conflagrations once underway.

4. Fight small fires.—Many fires which start in spite of kindling fuel treatment and spread in spite of barrier preparation can be extinguished by first-aid fire fighting and by the fire services. This activity aims to make each householder responsible for control of small fires on his own property and to make fire services more effective by provisions to equip and man them to national standards.

5. Confine fire storms and conflagrations.—This job provides the fire chief with a combat plan and pretrained and preorganized forces which will hold loss of life and property damage from mass fires to a minimum.

OPERATIONS RESEARCH

Operations research subdivides a problem into its action components, gathers and analyses existing information and experience relative to its solution, and devises practical and economic procedures which employ available facilities.

For this mass-fire problem, operations research would attack key jobs in each of the five listed activities and suggest action programs and guides for carrying them out. A research team of 10 to 15 men supplemented by clerical, statistical, and publications personnel, with provisions for contracting small parts of the job to other agencies, can do the job in 12 months. The research should operate under immediate direction of the fire research member of the Advisory Board or Commission who would present the board with research findings. Action programs resulting from research would then be stimulated by the board through appropriate fire services, Civil Defense, or other agencies.

Fire services have two ways to reduce the mass-fire destruction area:

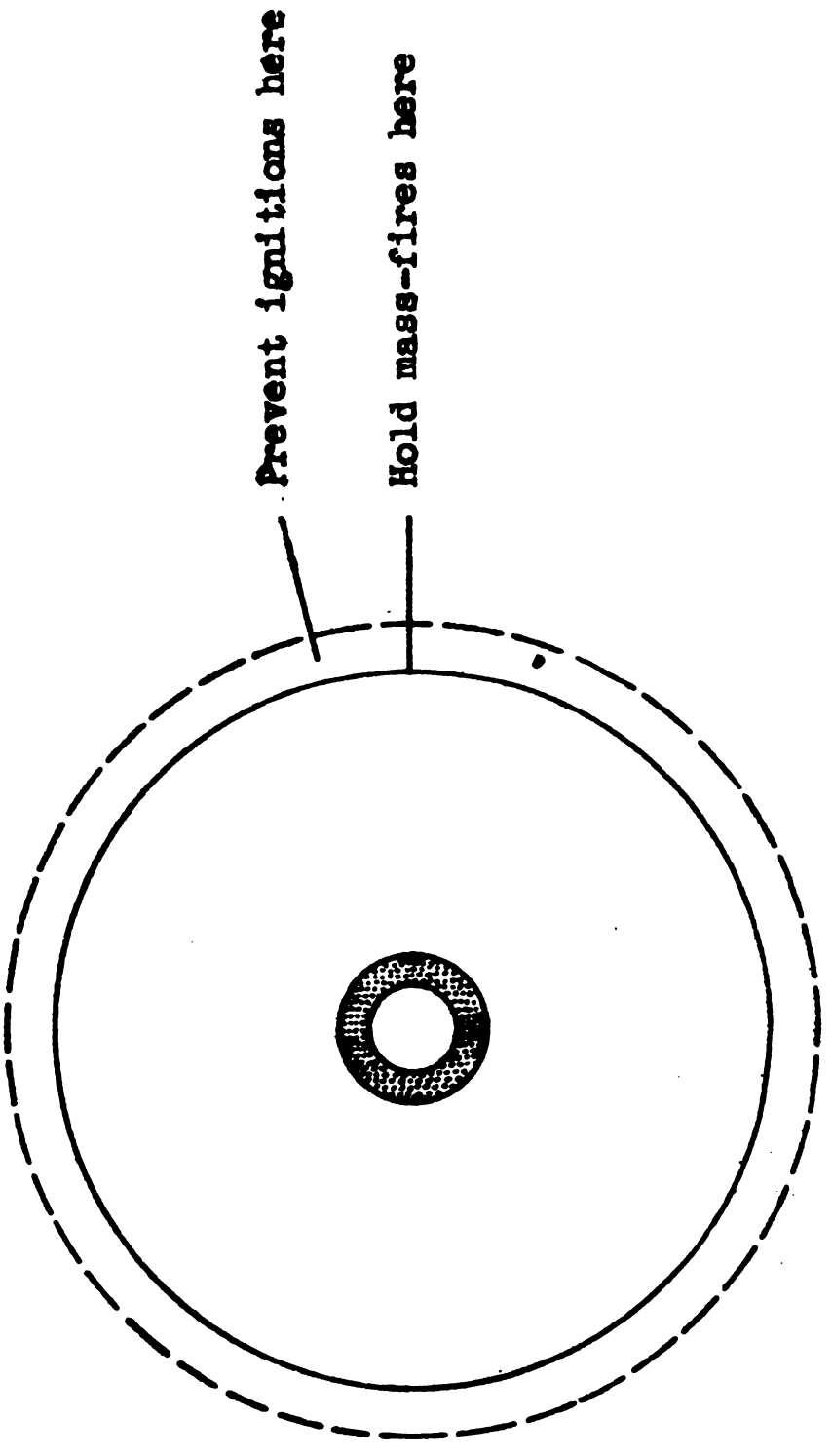
Prevent multiple ignitions from becoming mass fires.

Contain mass fires within their original perimeter.

Within a year

With existing knowledge organized by operations research for practical application by the fire services, potential mass-fire damage may be reduced like this:

[1] See end of article for quick reference to complete outline.



This reduction may appear to be minor—yet one-quarter of the total area lies within the area saved.

Operations research must then provide the fire services with better guides for—

Kindling fuel treatments.
Citizens first-aid fire fighting.
Specifications for escape routes and best use of existing barriers.
Preliminary combat plan for mass fires.

ANALYTICAL AND EXPERIMENTAL RESEARCH

Since practically no research has been done on control of fire storms and conflagrations, and since existing techniques and tools are not adequate when these phenomena occur, an aggressive research program is the only complete answer to the problem. Experimental and analytical research seeks to improve existing techniques and tools and to devise new ones when old ones are not adequate to meet a given problem.

Effectiveness of this kind of research has produced atomic weapons; similar investigative energy applied to mass-fire damage reduction should produce comparable defensive results. If this research is to provide practical answers for the fire services it must be in new fields and on a scale never yet tried in fire research. While it would be related both in objective and in methods to investigations already going on, it would present requirements far beyond the scope of normal peacetime research by civilian agencies.

Experience in forest-fire and other types of research has shown that the most productive long-term gains can often be made by specializing research activity. This brings together into unit-study programs research requirements of all problems requiring similar types of information. Preliminary analysis of the mass-type problem indicates that experimental and analytical research effort can best be organized in four broad categories of study units:

Fire behavior.
Fire prevention.
Fire control organization.
Fire suppression.

Some analytical and experimental studies providing information needed to meet ultimate damage reduction goals are shown in the following list:

FIRE BEHAVIOR

Free space combustion mechanism:
- Rate of combustion versus size
- Parameter determination

Weather influences
Fuel characteristics
Ignition pattern
Topography
Prediction systems
Mass-fire energy relationships

FIRE PREVENTION

Ignition potential reduction:
- Remove fuels
- Shield fuels
- Fireproof fuels
- Arrange fuels

Spread potential reduction:
- Structure modification
- Firebreaks
- Firefighting

FIRE CONTROL ORGANIZATION

Executive pattern of personnel
Qualifications of personnel:
- Managerial
- Staff
- Supervisory
- Labor

Training of key personnel
Liaison and communication
Mobilization and discipline mechanics

FIRE SUPPRESSION

Equipment
Strategy and tactics
Evacuation
Suppression planning
Suppressives
Mass psychology

Work in each of the four major categories should be organized on a project basis. Within each project study, teams made up of men qualified in the type of research involved would carry out analytical and experimental work. Direction of the whole program would be provided, as in the first phase, by the fire research specialist member of the National Advisory Board or Commission.

This initial approach to the problem is based on use of existing facilities scattered throughout the country. Quicker results and more intensive research are possible in centralized laboratory facilities which would require a large capital expenditure.

The scale of research effort is entirely a policy decision aimed at the question: What loss of life and property damage due to mass fire are we willing to accept?

With continued research

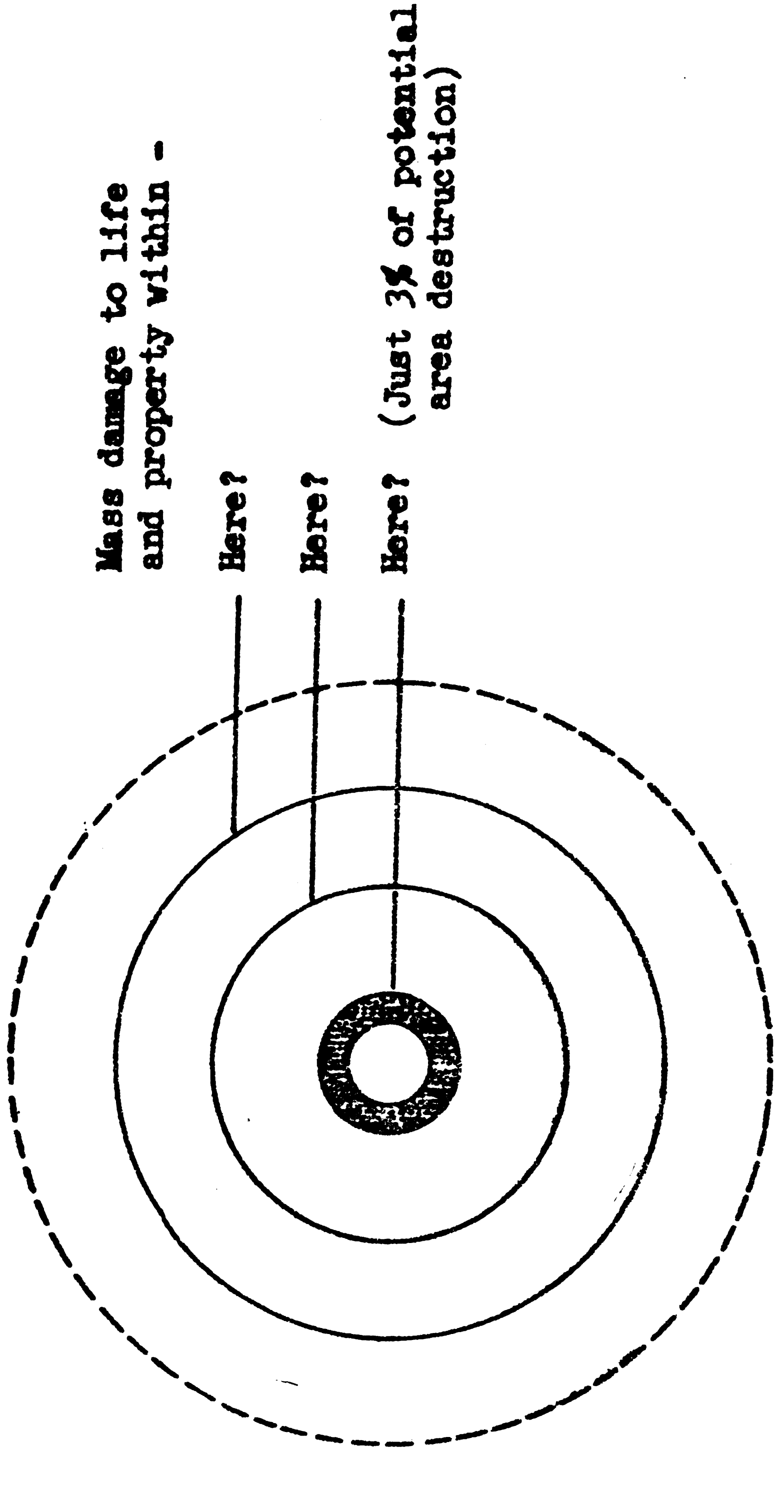
The wartime fire defense program with its analytical and experimental research aims at confinement of mass-fire damage to the demolition zone.

Probability of success in this effort in each community depends on—

Intensity of the overall research effort.

Aggressiveness with which these results are applied in any given community.

The question remains: What loss of life and property damage due to mass fire are we willing to accept?


Mass damage to life
and property within -
Here?
Here?
Here?
(Just 3% of potential
area destruction)

Operation analysis for combating fire storms and conflagrations in urban and wildland areas

Activities	Jobs	Some examples
1. Treat kindling fuels to reduce or eliminate ignitions.	Remove kindling fuels	Backyard trash. Clean up wholesale district areas.
	Fireproof kindling fuels	Fireproof paint structures.
	Shield kindling fuels	Dip curtains. Install shutters or fireproof blinds. Store kindling fuels under roof or screen.
	Arrange kindling fuels	Parked cars. Move kindling away from windows.
2. Prepare barriers to contain large fires and provide escape routes.	Establish open areas	Maintain parks and roads. Construct new selective openings.
	Establish physical and structural barriers	Interior fire walls. Fireproof exteriors. Standards for new construction.
	Establish water spray barriers	Sprinkler systems. Water supplies.
	Reduce fuel density	Slum clearance. Set standards for new construction.
3. Predict fire behavior to provide guides for emergency action.	Estimate probability of fire, storm, or conflagration	Can small fires be controlled by householder? Can regular fire services contain fires?
	Behavior of fire, storms, and conflagration	Rate and direction of spread. Control difficulty.
4. Fight small fires to prevent development of mass fires.	Train citizens in fire first aid	Householder fire suppression techniques. Supplies in the home.
	Increase effectiveness of fire services	Radio communication. Equip and man to national standards. Plan development.

5. Fight fire storms and conflagrations to contain at minimum area.	Develop to national standards a coordinated plan between military and civilian fire authority for control of conflagrations and fire storms.	Manpower. Equipment. Communications.
	Stockpile mass fire-fighting facilities	Demolition equipment. Transportation and communication. Fire-fighting equipment.
	Select and train military and civilian fire officials in "large" fire management.	Organization structure. Strategy and tactics.
	Prepare combat plan for fire storms and conflagrations	Designate and delegate authority: Organization structure. Job descriptions. Appraise situation: Make reconnaissance. Predict ultimate control perimeter. Mobilize: Select assembly areas. Effect mutual aid. Set up communications: Fire-fighting teams. Reconnaissance teams. Plan strategy: Evacuation requirements. Control plan. Set up servicing facilities: Provide food. Provide equipment service. Provide medical aid. Direct operations: Assign areas of responsibility to teams. Activate plan.

F. MEETING MEDICAL NEEDS

In determining the size of the medical workload which would have resulted from the attack posed by this exercise, it was considered first that little attention other than first aid could be given to the 8 million casualties dying during the first day (appendix 2). A great majority of the injured surviving the first day but who would eventually die, probably within 6 weeks, would require a substantial amount of medical care. Thousands of this group, however, might survive for such a short period that they could be given only limited medical services. In the remaining group of 3.9 million injured who would ultimately survive, there would be a sizable number whose injuries would be such that they would require little, if any, attention.

Evaluation of the above factors has led to the assumption that the total number of casualties from this attack for whom medical care of varying degrees would have to be given on a continuing basis would be 8 million, or two-thirds of the total injured.

Since many casualties would have received radiation dosages, either alone or in combination with blast and thermal injuries, it is obvious that fallout has an effect not only on the size of the medical workload, but the character of the job as well.

Appendix 3 shows the extent to which requirements for basic medical supplies could have been met. Except for emergency hospitals, Federal stockpiles would have been sufficient to care for only 2½ million of the injured for 3 weeks. If distributed uniformly throughout the entire 8 million requiring medical care, the supplies would theoretically have lasted only 3 days. The situation with respect to improvised hospital units would have been even more critical. About 9,000 of these units would have been needed for this size attack. FCDA had a total of 532 improvised hospitals under procurement at the time of Operation Alert and 200 more were in various stages of assembly. However, only one hospital would have been fully operational.

G. EVACUATION

A significant result of the exercise was the evidence it gave of the vital importance of evacuation as a means of saving lives. If the attack had been real, and had the 80 cities which simulated evacuations actually completed them, an estimated 5.9 million persons would have been spared death or injury.

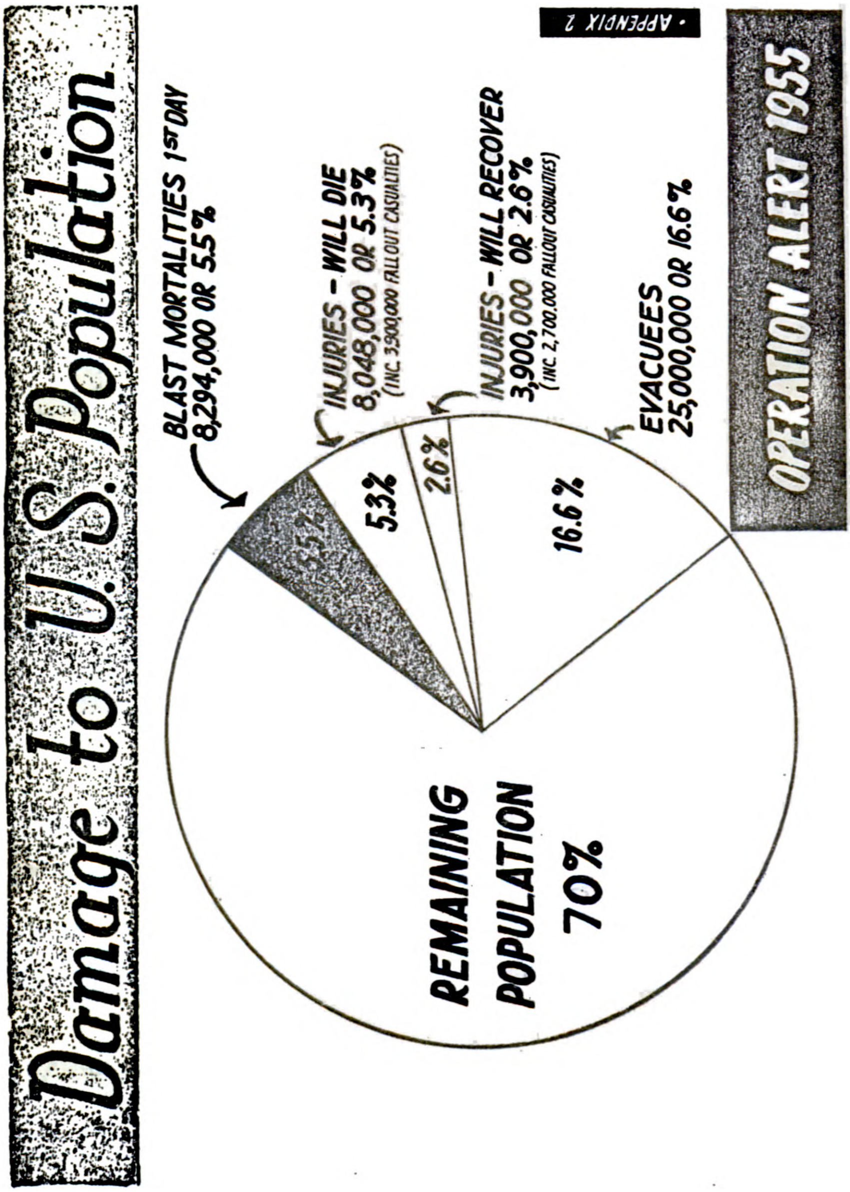
In Kansas City, for example, the following comparison can be made between what the casualties would have been under the theoretical evacuation reported, and the casualties without any evacuation.

	Mortalities		Injured, all causes
	Blast and thermal	Fallout	
With evacuation:			
Blast area	16,000	6,000	7,000
Outside blast area			18,000
Total	16,000	6,000	25,000
Without evacuation:			
Blast area	161,000	159,000	73,000
Outside blast area		34,000	21,000
Total	161,000	193,000	94,000

It will be noted that in this instance evacuation reduced mortalities about 94 percent and injuries about 73 percent.

Of course, all of the "savings" created by evacuation were highly theoretical. Most cities simulated a degree of evacuation which, in terms of completed and tested plans, would have been far beyond their capabilities. Too, in both the actual and the simulated evacuations, emphasis was on the mere movement of persons from one place to another, with little recognition given to the need for lodging, feeding, and otherwise caring for them in reception areas.

At the same time, the fact that this number of cities even assumed that they would evacuate their people demonstrated the widespread acceptance of the evacuation concept. Mayors, governors, and civil-defense leaders throughout the country are rapidly being convinced that despite the awesome problems involved in moving whole populations and providing for their care, there is no other answer to the threat of attack on our cities with high-yield weapons.



CIVIL DEFENSE FOR NATIONAL SURVIVAL

(PART 5—Baltimore, Md.; Detroit, Mich.; Syracuse, N. Y.; New York, N. Y.; Milwaukee, Wis.; and Washington, D. C.)

HEARINGS

BEFORE A

SUBCOMMITTEE OF THE COMMITTEE ON GOVERNMENT OPERATIONS HOUSE OF REPRESENTATIVES

EIGHTY-FOURTH CONGRESS

SECOND SESSION

MAY 4, 7, 14, JUNE 22, 25, AND 27, 1956

Printed for the use of the
Committee on Government Operations

UNITED STATES
GOVERNMENT PRINTING OFFICE
72769 WASHINGTON : 1956

CIVIL DEFENSE FOR NATIONAL SURVIVAL

(PART 6—San Francisco, Calif., and Los Angeles, Calif.)

HEARINGS

BEFORE A

SUBCOMMITTEE OF THE COMMITTEE ON GOVERNMENT OPERATIONS HOUSE OF REPRESENTATIVES

EIGHTY-FOURTH CONGRESS

SECOND SESSION

MAY 24, 25, 28, 29, and 31, 1956

Printed for the use of the
Committee on Government Operations

UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON : 1956

COMMITTEE ON GOVERNMENT OPERATIONS

WILLIAM L. DAWSON, Illinois, *Chairman*

CHET HOLIFIELD, California
JOHN W. McCORMACK, Massachusetts
EARL CHUDOFF, Pennsylvania
JACK BROOKS, Texas
LESTER HOLTZMAN, New York
ROBERT H. MOLLOHAN, West Virginia
L. H. FOUNTAIN, North Carolina
PORTER HARDY, JR., Virginia
JOHN A. BLATNIK, Minnesota
ROBERT E. JONES, Alabama
EDWARD A. GARMATZ, Maryland
JOHN E. MOSS, California
JOE M. KILGORE, Texas
DANTE B. FASCELL, Florida
MARTHA W. GRIFFITHS, Michigan
HENRY S. REUSS, Wisconsin

CLARE E. HOFFMAN, Michigan
R. WALTER RIEHLMAN, New York
CECIL M. HARDEN, Indiana
CHARLES B. BROWNSON, Indiana
GEORGE MEADER, Michigan
CLARENCE J. BROWN, Ohio
GLENARD P. LIPSCOMB, California
B. CARROLL REECE, Tennessee
J. ARTHUR YOUNGER, California
VICTOR KNOX, Michigan
OTTO KRUEGER, North Dakota
CHARLES R. JONAS, North Carolina
WILLIAM E. MINSHALL, Ohio

CHRISTINE RAY DAVIS, *Staff Director*
ORVILLE S. POLAND, *General Counsel*
WILLIAM PINCUS, *Associate General Counsel*
HELEN M. BOYER, *Minority Professional Staff*

MILITARY OPERATIONS SUBCOMMITTEE

CHET HOLIFIELD, California, *Chairman*

EDWARD A. GARMATZ, Maryland
JOE M. KILGORE, Texas
DANTE B. FASCELL, Florida
MARTHA W. GRIFFITHS, Michigan

CLARE E. HOFFMAN, Michigan
R. WALTER RIEHLMAN, New York
GLENARD P. LIPSCOMB, California

MEMBERS EX OFFICIO

WILLIAM L. DAWSON, Illinois
CLARE E. HOFFMAN, Michigan

MICHAEL P. BALWAN, *Staff Director*
HERBERT ROBACK, *Director of Investigations*
JAMES F. ECKHART, *Assistant Counsel*
EARL J. MORGAN, *Investigator*
ROBERT J. McELROY, *Investigator*
CAREY BREWER, *Legislative Reference Service, Library of Congress*

CONTENTS

APPENDIX

Mr. HOLIFIELD. We might be calling upon you for some additional testimony.

Mr. LYNCH. Thank you very much.

Mr. HOLIFIELD. Thank you, sir.

Mr. EARL. I appreciate your kindness, Chief.

Mr. HOLIFIELD. Colonel Earl, we are very glad to have you before us.

STATEMENT OF HOWARD EARL, DIRECTOR, DISASTER-CIVIL-DEFENSE AUTHORITY, COUNTY OF LOS ANGELES, CALIF.

Mr. EARL. Mr. Chairman, my name is Howard Earl.

Mr. HOLIFIELD. This is Congressman Garmatz.

Mr. EARL. How do you do, sir?

Mh. HOLIFIELD. Congressman Kilgore, and this gentleman is our local Congressman.

Mr. EARL. It is a pleasure to know you.

Mr. HOLIFIELD. Just pull up a chair over there.

Mr. EARL. Gentlemen, I have prepared an agenda——

Mr. HOLIFIELD. Colonel Earl we are sorry that we are late in our schedule today. You have been here today, and you know the reason why we are late.

The interest of the committee and the witnesses and the questioning has thrown us a little bit off schedule.

We plan to go from now until 4 o'clock and then adjourn until tomorrow morning. We are not inclined to cut your testimony or Mr. McMillan's or Mr. Yale Hurt's testimony. So if we do not finish with your testimony today, we will work you in on tomorrow's witness list. We may have to put certain people on first in the morning because of previous commitments to them, and some of them have traveled some distance to get here.

But we know that all of you folks are local folks and that we can place your testimony together in the printed record, if you would like it that way.

But we have an hour now to give you, sir, and you proceed in any manner in which you wish.

Mr. EARL. Honorable chairman and members of the honorable committee, actually, what we have done is to prepare an agenda, and an agenda which will require approximately 180 minutes of time. That is 3 hours. We have it sectionalized, however, as you will see in observing it, so that we can arrange to accommodate whatever time schedule you and the members of the committee desire to set for us.

Mr. HOLIFIELD. Would you be willing to appear at a night session in case we do not have time during the day?

Mr. EARL. As far as my staff is concerned, we would. Mr. Don McMillan is here, and it would be up to him to agree to it.

Mr. HOLIFIELD. I will have to consult with my committee members and my staff and see if that is possible on one of the days that we are here. We are here Monday, Tuesday, and Thursday. We will not be in session Wednesday because of Memorial Day.

Mr. EARL. Yes, sir.

Mr. HOLIFIELD. But I suggest you proceed with your presentation as you have planned it, and then we will see what we can do as we go along.

Mr. EARL. All right, sir.

I do have the printed statement on the information that I will give the first 35 minutes to.

Mr. HOLIFIELD. Have you copies of that?

Mr. EARL. We do have them available, and one of my assistants will submit them.

Mr. HOLIFIELD. I would like to have copies submitted to the committee members, please.

Mr. EARL. Mr. Long will present it to you.

Mr. Holifield, I do have some area mosaics from the basin area survey that I was going to put on exhibit. However, we will not have time to present the interim survival plan this afternoon. So maybe you would prefer that we withhold that exhibit until we put on the interim survival plan.

Mr. HOLIFIELD. Yes, that will be all right.

Mr. EARL. All right, sir.

Effectiveness of the present civil-defense program:

I do not believe the present civil-defense program can be called truly effective. Of course, evaluation of the effectiveness of the program depends to some degree on what phase is being considered.

For emergency operations of an area nature, such as against floods or earthquakes, civil-defnse agencies of local jurisdictions in southern California are relatively well prepared. Success of these preparations is due in large part to the cooperative spirit of the civil-defense directors and to the excellent mutual aid agreements entered into by most jurisdictions. Closer coordination of planning and operations can and should be attained but we are confident we are on the right track. Area planning will be taken up separately but I should say here that under the present organization of emergency services, we have attained a promising degree of coordination in our planning to meet and overcome natural disaster.

For war-caused disaster—especially the threat of one or more H-bombs—our status of effectiveness is woefuly inadequate. We are still adhering to the policy of shelter—or "duck and cover". Despite considerable publicity of the destructiveness of the H-bomb, a majority of our population are not convinced that you cannot live with this monster. It is difficult to make people realize that there can be danger which they cannot hear, smell, or see—or feel, until it is too late to do anything to prevent death or serious injury. Yet, this is the stark—and lethal—hazard of radiation.

About 2 years ago, the Los Angeles County and Cities Civil Defense Planning Board voted to support a study of the problem. The planning board secured financial provisions from the Los Angeles County Board of Supervisors and quarters and equipment from cities within the county to carry on the basin area survey. The job of directing the survey fell to me. We secured a research staff and went into every detail throughly and analytically. Recently, the basin area survey issued a recommended interim survival plan, which is now under study by the planning board and all jurisdictions within the county—and to some degree by the communities in neighboring counties and the State of California.

One of the major findings of the basin area survey was that an agency was needed which would coordinate the defense programs of

the jurisdictions concerned. We found that, despite the fine spirit of cooperation and sincere efforts of the individuals and agencies concerned, communities which bound each other not only had different plans but that often those plans would defeat each other. Let me cite one brief example—warning. When the alert of May 5, 1955, took place, only a very limited number of the jurisdictions actually sounded their sirens. Other jurisdictions were still debating what to do—or lacked the means of doing anything—when it was called off about 10 minutes later. Had the alert been real, this inability to proceed in an orderly manner could have cost many lives. Time is our most precious asset if we are to save our people and our economy.

The basin area survey recommends an organized and orderly evacuation. I'd like to stress those two words—"organized" and "orderly." With the movement limitations caused by the ocean and the mountains, we know that every possible means must be used to reduce the number of vehicles on our restricted highway resources.

We also know that "shelters" within 20 miles of where an H-bomb goes off will be little more than deathtraps. The primary blast dangers end at about half that distance—based on the probable maximum weapons which can be delivered today. But deadly radiation extending much beyond that area will continue for months, weeks, or days—depending on the distance from the attack point. We finally decided that distance was the only practical shelter.

[NOTE.—Mr. Earl subsequently requested that the above paragraph be changed to read as follows (see pp. 2495–2496):

[We also know that within 20 miles of where the H-bomb goes off an unprotected person stands little, if any, chance of survival—as in a deathtrap. The primary blast dangers end about one-half that distance—based on the probable maximum weapons which can be delivered today. It is in this area and out to the perimeter of radiological throwout that "shelter" sufficiently well constructed to protect from radiation might be effective. Downwind extending for many miles in the so-called fallout zone, lethal radiation also would require cover of similar quality, depending on the distance from the strike point.]

My comments have only briefly touched a few of the important parts of the interim survival plan; others are to be given you as the closing portion of our presentation. I think my remarks have conclusively pointed out the lack of effectiveness in our present civil defense program.

Mr. HOLIFIELD. I would like to go back just to the former paragraph.

Mr. EARL. Yes, sir.

Mr. HOLIFIELD. "We also know that 'shelters' within 20 miles of where an H-bomb goes off will be little more than death traps." And you have the word "shelters" in quotes.

Mr. EARL. Yes, sir.

Mr. HOLIFIELD. Would you explain what you mean by that, sir?

Mr. EARL. Well, picture, if you will, a hydrogen weapon or device similar to the one that was exploded in the Pacific a few days back, which would create a hole in the ground, if you please, ranging in depth from 175 to 250 feet with a diameter of from 4 to 5 miles, and then where the fireball of, say, a 20 megaton bomb touches the ground,

and then tell me, if you will, how a shelter can be built to offset such a destructive device and still preserve your life.

That is what we mean by the statement that, in accord with the national policy of the National Security Council, and in accord with the Federal and State policy, we believe that distance is the only way you are going to save your life in the face of the hydrogen bomb threat, distance from Ground Zero.

Mr. HOLIFIELD. I think we should clarify this point right at this point.

The blast in the South Pacific which dug the crater was a ground burst, and the bomb which was discharged last week was an airdrop, and that type of bomb created no hole in the ground. The first one did.

Now, of course, we do not know where the enemy would explode a dropped bomb, whether they would explode it on the ground or whether they would explode it in the air. It would be according to what they wanted to achieve.

But upon what authority do you say that shelters 20 miles from Point Zero would be death traps? Is that your personal opinion, or do you base it upon some authoritative report.

Mr. EARL. It is in accord with the releases of the FCDA and the Atomic Energy Commission.

Mr. HOLIFIELD. What releases, and when were they made?

Mr. EARL. They were made in 1954 in connection with the bomb drops in 1952 at Bikini, and information upon——

Mr. HOLIFIELD. You mean to say that those positions of the FCDA have not been modified or changed in any way since?

Mr. EARL. I do not quite understand your question there.

Mr. HOLIFIELD. Are you making this statement here in this first sentence as being backed up by the releases of the Federal Civil Defense Administration, their present position?

Mr. EARL. Those were the releases that caused the basin area survey to change the study from one of feasibility of dispersal from this area to one of actually developing the plan that has been issued.

Mr. HOLIFIELD. Will you supply this committee such information as you have spoken of, such releases from the FCDA, so that we can inspect them?

Mr. EARL. I will supply you with the information in our files on the basin area survey, yes; which at the time that——

Mr. HOLIFIELD. We have the basin area survey. We have had that in our hands for some time.

Mr. EARL. Yes.

Mr. HOLIFIELD. And this is not in accord with the information which the committee has on this subject. And that is why I asked you for substantiation of FCDA's releases.

Mr. EARL. Yes, sir. I will give you such information as we have in the interim survey file.

Mr. HOLIFIELD. If this is the position of the FCDA, this committee will certainly add to their several days' hearings when we get back to Washington and ask them to give us some information on this point.

Mr. ROBACK. Mr. Chairman, may I ask a question?

Mr. HOLIFIELD. Mr. Roback.

Mr. ROBACK. May I ask also, in this survey which was referred to, if the conclusions about shelter are based upon the estimate on page 15 that it would cost $3,000 per person?

Mr. EARL. I believe that it is $1,500 as the minimum cost.

Mr. HOLIFIELD. $1,500 per person?

Mr. EARL. For a shelter for two persons.

Mr. ROBACK. Here is a reference to a $6,000 shelter to accommodate 2 persons.

Mr. EARL. That was the type of shelter that one of the gentlemen with whom we discussed the matter said he would build for himself.

Mr. ROBACK. My question was whether this information was the basis for rejection of the shelter concept in this study.

Mr. EARL. No, sir. If you will note the survey report, it says that we have taken a more moderate consideration and have reduced the cost of the shelter to the very minimum which we think would provide a shelter which would give the protection set forth in the report. And as a result, we found that the cost of those shelters, if placed in the backyards in the area which we are discussing here this afternoon, would be $7 billion, which is an impossible economical thing.

Mr. HOLIFIELD. Are you aware of the testing of shelters in Nevada within the last 2 or 3 years?

Mr. EARL. Yes, sir.

Mr. HOLIFIELD. And the cost of those?

Mr. EARL. The information gleaned from those tests went into this report and went into that calculation.

Mr. HOLIFIELD. Of course, $6,000 for 2 persons is, I will agree, a very high cost.

Mr. EARL. That was an extra, superdeluxe model that this gentleman who has given us the information said that he would build for his own family if he were expected to survive in a shelter.

Mr. HOLIFIELD. Of course, anyone could build any price shelter they wanted, I suppose, if they wanted to. But we have had testimony before our committee from the Federal Civil Defense Administration within the last 2 weeks by Mr. Taylor, who is in charge of their shelter study and has been for the last 4 or 5 years, or at least 1 of the top men in that study, and his testimony was that the estimate of shelter was nearer $100 per person.

Mr. EARL. You are talking now of the public shelters?

Mr. HOLIFIELD. I am talking of a public-type shelter, and he gave other costs on industrial-type shelters that ran a few hundred dollars, but nothing in the nature of $3,000 or $6,000.

What is the date of this survey, Mr. Earl?

Mr. EARL. The survey was released 8 weeks ago.

Mr. HOLIFIELD. I see.

Mr. EARL. Mr. Chairman and members of the committee, I am sorry to see that we have diverted from my introductory statements here and went into the interim report. I wish that——

Mr. HOLIFIELD. We are not going into the interim report. But a statement like this calls for questioning at sometime, and, of course, we have been interrupting the other witnesses as we went along.

Mr. EARL. That is all right; very fine.

Mr. HOLIFIELD. We could not let a statement like that stand without questioning, and at least letting the committee have an opportunity

to give the public record the benefit of some of the testimony that has been given to us on the same subject.

Mr. EARL. Fine, sir. I am perfectly agreeable that the committee ask questions, of course. But I just wanted to say that the matter of the interim report has been arranged on my agenda, which was presented to the committee to cover a full hour or more of discussion, and if we get into that field, then these questions which are just mentioned here in the introductory part can be taken up in detail by you folks in questioning or by us in giving you the answers.

Thank you.

Mr. HOLIFIELD. Mr. Garmatz?

Mr. GARMATZ. Mr. Chairman, Colonel, I just wanted to ask you one question.

In the second paragraph on page 2 there, you say:

We finally decided that distance was the only practical shelter.

Do you mean the shelter of a distance away from point zero, or do you mean to say "evacuation"?

Mr. EARL. The distance that you are away from where the bomb hits.

Mr. GARMATZ. This does not in any sense mean evacuation, does it?

Mr. EARL. It certainly implies that, yes, sir; because if it is dangerous to be within 20 miles of where a bomb strikes, and you are within a 10-mile radius of where that bomb strikes, it certainly would mean that you would attempt to get 10 miles farther out from it. So it does imply evacuation; yes, sir.

Mr. GARMATZ. In other words, your thinking is along the evacuation line instead of shelter?

Mr. EARL. Yes, sir; within the 20-mile perimeter of a possible bomb strike.

Mr. GARMATZ. Evacuation is the only way?

Mr. EARL. Yes, sir. It is the way that will save the most lives.

Mr. HOLIFIELD. You may proceed.

Mr. EARL. We are doing our best locally to correct these deficiencies, and through the FCDA-State of California contract with Stanford Research Institute for a survival survey, we know our position will be fortified. But the Stanford survey is just starting and it will be a year or longer before their results can begin to be implemented.

Can we afford this delay? No one knows; no one can reasonably forecast the timetable of our probable enemies. Those of us who have worried over this problem longest and studied it in greatest detail feel that every level of government—from the Federal down—should get busy now and improve the effectiveness of our program.

All life is subject to transition and we know our plans must be revised as the guided missile changes from experiment to operational weapon. That is why we believe we should improve our organization and procedures today, making them flexible enough to adapt to the advanced planning of Stanford Research Institute and to the changing conditions of the future.

THE CONCEPT OF TARGET AREA PLANNING

Target area planning seems to be one of the most sensible developments in recent defense strategy. Let me go back to the local problem and to the findings of the basin area survey.

Congressmen Holifield and Lipscomb know we have some 50 jurisdictions in the Los Angeles County portion of the basin area alone. There simply appears to be no reasonable way in which to plan except for all of them.

If you gentlemen will examine the southeastern portion of our county, you will find that about the only real division between Los Angeles and Orange Counties are some signs on street corners. The same general situation applies between Pomona in Los Angeles County and Ontario in San Bernardino County. I could cite other examples, but these illustrate my point.

Are you going to draw a line at these arbitrary, geographic boundaries and say, "This is it?"

Gentlemen, we actually had planners in one area basing their recommendations on Los Angeles residents being stopped at the county boundary. What would you say to this rather fantastic suggestion? What could anyone say? Other than that we could not attempt any such stoppage and that, if the people were to be stopped, this other area had better man their guns and shoot us down as we cross the line.

Further, whether or not civil defense ever agrees on evacuation, we know that hundreds of thousands of people—probably millions—are going to decide for themselves that they are going to leave, evacuate, disperse, vamoose, head for the hills—whatever you want to call it.

Where are these people going? Probably just as far as they can, in every direction that has routes to get them there. And that means they are going to enter in or pass through our neighboring jurisdictions.

If those communities don't prepare to manage these people and control the situation, what can happen except chaos, riot, and confusion? In deep stress, you all know what to expect. Let us put the shoe on ourselves. If we or our families are starving, freezing, or dying from thirst, do you think we are liable to observe all the niceties of day-to-day living, especially imaginary boundaries?

Now, how can this problem of defense be solved? There appears to be only one logical answer: By tackling it on the scope of the economic unit or the target area.

This procedure will certainly necessitate crossing municipal and county lines and may even cross State lines. Certainly, it must cross State lines back East where State areas are smaller. Here in Los Angeles we know that Denver and Phoenix are two of our market gateways. If we are to survive, we know these gateways must be kept open, or substitute locations must be ready and equipped to replace them. And I mean ready—no paper deal that looks and sounds good but has no basis in fact.

We have looked into our resources. Los Angeles is the market center of all of southern California. The major market operations are located almost in the center of what would be the sensitive area. Hence, we are forced to write them off in our planning.

We find that retail outlets normally carry 3 to 7 days' supply for their normal trade, this difference in inventory largely depending on how conveniently they are located to wholesale facilities.

Then, we have what is in the homes plus the productive resources of the support adeas. These combined supplies must support our population if it is forced to move. As near as we can estimate, with rationing, we could keep going 3 to 5 days without resupply. What then?

Our plans must provide for the renewed flow of essentials from outside sources or people are going to die.

The Los Angeles County and Cities Civil Defense Planning Board recognized the need to consider a broader scope in planning. Upon order of this group, I submitted a request to the Los Angeles County Board of Supervisors for authorization and the issuing of invitations to six of our neighboring counties to join in mutual civil-defense considerations. This request was granted by the Los Angeles County Board of Supervisors on May 22, 1956. We have high hopes that this cooperative and mutual planning will do much to integrate civil-defense efforts in the Los Angeles metropolitan area.

If we are going to survive as a community—and the country as a Nation—there appears to be no alternative to target area planning, here in California, or for any other target area in the United States.

Mr. HOLIFIELD. Mr. Earl, this committee certainly agrees with you that the planning must be on a target area basis, that we must have a master plan for each target area complex.

Mr. EARL. Yes, sir.

Mr. HOLIFIELD. And we are certainly in accord with that, for the reasons which you give and many other reasons.

Mr. EARL. Honorable Chairman and members of the committee, the subject matter that I am covering in this introduction is in answer to these questions that your committee specifically proposed to me in our correspondence.

Mr. HOLIFIELD. Yes, sir.

Now, on the yellow sheet, which is your progress report, can we accept that into the record, and then you proceed?

Mr. EARL. I would like to have you do it, sir. That is a copy of the report that the board of supervisors did receive on the 22d day of May.

Mr. HOLIFIELD. Fine. We will read this and have it as part of the official record.

Mr. EARL. Thank you very much.

(The progress report referred to is as follows:)

MAY 9, 1956.

Subject: Progress Report of Committee for Coordination of Civil Defense Planning and Operations.

LOS ANGELES COUNTY AND CITIES CIVIL DEFENSE PLANNING BOARD,
Los Angeles, Calif.

GENTLEMEN: Based upon preliminary conferences held by your committee and consultation with Harold W. Kennedy, the county counsel and member of the planning board, it is—

Recommended:

1. That the Los Angeles County Board of Supervisors be informed of planning board acceptance of their request to make a study for improved coordination of civil-defense planning and operations.

2. That the Los Angeles County Board of Supervisors be furnished copies of this initial progress report by your committee.

3. That your committee has given consideration to the scope of the study and after analysis, find that some phases of the problem extend beyond the boundaries of the county of Los Angeles to include the market and trade areas in adjoining counties.

4. That, therefore, the planning board solicits the Los Angeles County Board of Supervisors to contact the board of supervisors of contiguous counties, inform them of the purposes of the study and invite them to join in the phases of the planning board committee considerations which concern their jurisdiction.

Reasons:

1. Under date of February 8, 1956, Chief Administrative Officer Arthur J. Will, forwarded a report to the Los Angeles County Board of Supervisors, including the following recommendations:

(*a*) That the board of supervisors request the Los Angeles County and Cities Civil Defense Planning Board to study the current operational area structure within the county to formulate a plan whereby consolidation of existing areas can be accomplished and a closer coordination of jurisdictional activities achieved.

(*b*) That the Los Angeles County and Cities Civil Defense Planning Board be advised that the board of supervisors considers the successful completion of such a study to be a matter of extreme urgency and that the adoption of the foregoing recommendation is to be interpreted as an expression of the willingness and desire of the county to cooperate fully in the implementation of a feasible countywide civil-defense organization.

The recommendations of the chief administrative officer were approved by order of the board of supervisors on February 28, 1956.

The request of the Los Angeles County Board of Supervisors was presented at the next regular meeting of the Los Angeles County and Cities Civil Defense Planning Board, which was held on March 14, 1956. Generalized comment and discussion followed without formal action, the matter being referred to a recessed meeting of the planning board scheduled for March 21, 1956. At the recessed meeting, the planning board adopted a motion accepting the request of the board of supervisors to make the study and a committee of three was appointed to supervise and administer it. Committee members selected were Richard F. Lynch, to represent interests of the city of Los Angeles; Robert Coop, to represent other municipalities within the boundaries of Los Angeles County; and Howard Earl, to represent the unincorporated areas of Los Angeles County. The assistant director of the basin area survey was assigned to serve the committee in its research activities.

At its initial meeting, Mr. Coop was elected chairman of your committee.

2. It is deemed appropriate and advisable that the Los Angeles County Board of Supervisors be kept fully and currently informed of planning board activities to improve coordination of civil-defense plans and operations in order that they may be cognizant of the progress of their requested study and the expeditious manner in which it is receiving attention and consideration.

3. The ineffectiveness of the present seven operational areas organization is recognized by the office of civil defense of the State of California, the coordinator for region I of the State office of civil defense, by practically all of the municipalities in Los Angeles County having formal civil-defense organizations, as well as by the Los Angeles County Board of Supervisors, whose cognizance of the deficiencies resulted in the request for the study. There is general recognition of the basic need for an effective policymaking body assuring adequate representation to all jurisdictions and in which all will desire to unite not only for civil-defense planning but also for the coordination of overall emergency operations in the event of a major disaster. Such an organization must be designed to provide the means whereby, in an extreme emergency, it can be integrated completely and interlocked into the statewide civil-defense operation.

4. The problems of coordination cannot be confined within the geographic and political boundaries of Los Angeles County in all phases of the problem and therefore, neighboring counties included in the marketing and economic sphere should be invited to participate with your committee in consideration of mutual interest. Since the study was requested by the Los Angeles County Board of Supervisors, it is believed courteous and appropriate that the invitation for participation of other jurisdictions should emanate from them.

Your committee anticipates further conferences at an early date to develop implementation of the above factors and to direct attention to other problem areas of civil-defense organization and operation. It is the purpose of your committee to give exploratory investigation to all types of organization in order that the planning board may propose to the Los Angeles Board of Supervisors and all other interested jurisdictions the most feasible, effective and acceptable organization possible.

Respectfully submitted.

ROBERT COOP, *Chairman.*
RICHARD F. LYNCH.
HOWARD EARL.

Mr. HOLIFIELD. Mr. Garmatz.

Mr. GARMATZ. Just one question.

Mr. EARL. Yes, sir.

Mr. GARMATZ. Colonel, in this concept of target area planning, in some of this talk here, you speak as though you are not getting cooperation from 1 county or 1 neighboring small community to the other. You talk about "shooting us down when we cross the line," and in the next paragraph you just do not know how to cross, and what is going to happen to these boundaries.

Does that mean that you are not getting cooperation? I do not quite follow that.

Mr. EARL. Mr. Garmatz, that was cited as an example of the impossibility of just one community trying to plan for anything as big and as dreadful, if you please, as a hydrogen weapon would be.

In other words, I showed that just as an illustration of the impossibility of 1 community or a group of 3 or 4 communities, or even 1 county, for that matter, being able to lay down an overall plan which would be a satisfactory plan to defend oneself against the capability of the hydrogen bomb.

Mr. GARMATZ. Are you getting cooperation from your neighboring counties?

Mr. EARL. Absolutely.

Mr. GARMATZ. You are?

Mr. EARL. We have had the utmost cooperation with those counties.

In the basin area survey, we had six of our neighboring counties associated with Los Angeles County in that effort, and right up until the time that the State of California made a statewide mass area study, which was predicated upon the idea of developing the resources on the periphery of a target area, so that those resources could be generated into the care of the people leaving the target area or leaving the urban areas, and that occurred in November 1954, and subsequent to that time the State took over that phase of the study which is the backup for this interim plan, again, that we discussed previously.

Mr. GARMATZ. That is all I have, Mr. Chairman.

Mr. HOLIFIELD. Proceed.

Mr. EARL. Thank you, sir.

EFFECTIVENESS OF FEDERAL CIVIL DEFENSE ASSISTANCE AND GUIDANCE TO STATES, COUNTIES, AND CITIES

(*a*) The assistance and guidance of the Federal Civil Defense Administration has been improving but, like most other local officials in civil defense work, I wish that improvement could be accelerated.

We still find ourselves facing criticism because of statements by officials of various Federal departments. Statements that are contradictory or at odds with each other. Such proceedings keep local authorities constantly in difficulty, and I think all Federal officials should refrain from issuing statements until they know their ground, and then within the limits of national security, they should be frank and candid.

(*b*) We greatly needed an official representative of FCDA in Los Angeles, one of the major target ares. One has recently been assigned, and I join all other local officials in endorsing this move. We all hope

this will provide the means of getting the official national policy and opinion down to the local level quicker than previously.

We also believe that this representative will assist in bringing the individual characteristics of our area and our problems into sharper focus for the Federal officials. These matters have not been satisfactory in the past. So I mention them, but we are glad to see if the present corrective measures will provide the answer.

(*c*) The matching fund program has been of great assistance to local agencies and we only wish it might be expanded. The county government has received to date only $296,000 under this program for various warning, communications, fire-fighting, and training purposes.

(*d*) The Federal leadership in aiding local jurisdictions hit by hurricane, tornado, or flood during the last 2 years, has been excellent, in my opinion. For a new and untried program in Government, I think it has been well handled, has really assisted stricken communities to recover surprisingly fast and is proving that civil defense can pay off like insurance.

As you probably know, I was able to establish a precedent by securing Federal funding assistance, under Public Law 875, for mutual aid the county furnished a local community—Sierra Madre—during the floods of 1933. I believe this approval wil be a boon to mutual aid, everywhere, and it is one of the finest features of the civil defense program.

(*e*) Previously, I have commented on target area planning. Locally, we think this concept is the only practical one, and we feel it is one on which the Federal agency must carry the ball. We would like to see them really take the lead, pitch in and assist in testing target area planning in various locations and then extend the program if it proves successful.

Mr. HOLIFIELD. Up until today, though, you have not had that type of leadership and planning assistance?

Mr. EARL. That is correct.

It has been coming, and the Congress appropriated $10 million last year to the FCDA to start in a program of this target area planning, and the plans are coming into our communities through such agencies as the Stanford Research Institute.

Of course, this interim plan that we have here is right down the same line. The Stanford Institute is going to use every bit of this report that you have here as a basis for starting their study——

Mr. HOLIFIELD. You mean, they are going to use the information in it as source material?

Mr. EARL. As source material.

Mr. HOLIFIELD. You do not mean that they have given approval to it in its entirety?

Mr. EARL. Oh, no, sir; they are making an independent survey. They are going to use it as source material, basic information upon which they are starting their study in southern California.

[Continuing:]

CLARIFICATION OF FEDERAL RESPONSIBILITY AND LOCAL RESPONSIBILITY

You've broken this question down in three categories. The first is "planning." We think the Federal funding of local survival studies

is a fine thing. You can't write a standard set of specifications on the Federal level that will fit the needs of all communities.

We think Stanford Research Institute—financed by Federal funds—will write what is needed for the target areas in California. We do wonder what powers of persuasion they will use to secure the unanimous approval of all the local jurisdictions involved. That is why the locally financed interim survival plan recommends creation of a Survival Authority, which would have equitable representation of all local jurisdictions. This authority would develop policies and programs, and in return for representation all of us would agree to go along with the majority.

We feel the Federal funding assistance is about as far as FCDA can go in aiding local planning. Implementation of those plans—the long, painful physical process of developing the staff and materials to make those plans operational—is up to the local jurisdictions. However, it may well be that Federal funding assistance will be necessary for local directors like myself to build the required organizations.

Mr. HOLIFIELD. If the Federal Civil Defense Administration furnished you moneys for these plans, as they are in the Stanford research study, is it not your opinion that if a master plan were developed, they will also have to cooperate in the plan which is developed as far as giving their approval and as far as coordinating it with the military departments, and so forth?

Mr. EARL. Mr. Congressman, I think that it will be very necessary for the Federal Government to assist the local government in implementation of a master plan, built in it for operations, and then further than that, after you get your operating plan set up, you have got to think in the field of care for the people when they get out there.

In other words, you will have to think of preplanning stockpiles to eliminate deficiencies which might occur in our outlying counties, and so forth, to take care of our people when they do move into their areas.

The second category is on "operations." Here, I believe the higher jurisdictions must guide and coordinate but otherwise depend on local counties and cities to produce the desired results.

In southern California, in event of a declared emergency, all operations will be in the name of the State of California, but it will be the local officials acting for the State who will have to carry out the physical operations.

The State staff is simply insufficient except to coordinate and shift whatever assistance is available to the more acutely troubled spots. The State will be boss, yes, in the sense of statewide operations, just the same as FCDA is boss of the States on the national scope. But it all comes back to the fact that the success of an emergency operation must depend upon the sum total of efforts of all the service personnel at the base of the totem pole.

The final actegory on responsibilities concerns "financing." Money is always a problem, isn't it? I think there is no more question about civil defense being important to the whole country than there is about military defense.

The Los Angeles metropolitan area is the economic heart of all of southern California, as well as being a major factor in the economies of Arizona and Nevada, and to some extent New Mexico and Colorado.

Disturbance here upsets all the people in these areas, as well as effecting the national economy.

No local target area can tax these areas nor equitably distribute the costs. We think the Federal Government can provide for such an equitable distribution of costs. We believe that the major target areas are, at least, entitled to a degree of subvention which will make it possible for them to develop the defense organizations and operations needed for the general defense.

EFFICIENCY OF LIAISON AND COOPERATION BETWEEN FCDA AND LOCAL POLITICAL SUBDIVISIONS

This item is difficult to evaluate at the present time. Elsewhere, I have commented that until recently it was unsatisfactory. But the recent assignment of a local representative of FCDA will, in my opinion, solve this problem.

Let me say the county of Los Angeles heartily endorses this assignment and hopes it will provide for the desired liaison and cooperation. We may need more, but this is a step in the right direction.

SUGGESTIONS FOR FURTHER CIVIL-DEFENSE PLANNING

1. We need improved, intelligent leadership, executive and legislative, in civil defense at all levels. We recognize that civil defense is a relatively new function of Goverment and that we are going to encounter "growing pains" for a long time to come. It is my opinion that, like other governmental activities, civil-defense responsibilities and areas of operation will be resolved by mutual interest and by the exigencies, the requirements, of the situation.

It appears entirely impractical to attempt to operate out of Washington; by that, I mean from the Federal level, entirely. Civil defense differs from defense by the armed services, in that it covers the land, not just lines and locations. Most of the people who advocate Federal control throughout might voice the loudest complaints if control were actually centralized there. Neither do I think it can be maintained on a strictly local level. There must be coordination and logical integration.

We, as a country, cannot ignore this problem any more than we can ignore defense by the Armed Forces. This problem is too big for localities and too detailed for Federal solution. Consequently, it appears certain that a blend—Federal leadership and coordination with local control and operation—will eventually result. In the interim, let's encourage thoughtful, intelligent statements and leadership and try to end some of the irresponsible, misleading activities of self-appointed experts.

2. We need a little more hardheadedness about security. We are told that certain procedures are recommended, that weapons development makes such planning essential, but that we cannot publish this confidential information. Next week, we pick up a magazine with the whole spread in greater detail than our confidential briefing. This magazine can be bought by anyone who so desires, so it is certainly available to our potential enemies. But the great mass of American people never see it because they are too busy with their own interests.

When we attempt to implement the program, our people don't understand and we cannot give official credence to magazine articles. Consequently, we say some of our information is classified and our citizens remain uninformed, but resentful. And it is extremely difficult to get Americans to cooperate with something they do not understand. You gentlemen know that.

We surveyed the public affiairs and information programs all over California for the basin area survey in August 1955. Our research indicated civil defense agencies had been reaching about 1 in 20 citizens, or 5 percent of the coverage. This situation is pitiful—only 1 in 20 knowing what is and what needs to be done for his own safety.

So, reasonable but not excessive security measures, coupled with a greatly intensified public affairs and information program, are improvements acutely needed.

3. This suggestion concerns "target area planning." Consideration is being given to a program of Federal contributions for part of the administrative expenses necessary for these target areas to plan and implement survival procedures. The maintenance of these communities is vital to the country at large, and we believe it is equitable for part of the costs to be distributed on a national basis.

Further, such allowances will tend to develop the coordination and integration so vitally needed in the nationwide civil-defense program.

Consequently, I not only endorse such action but urge your committee to do all possible to expedite the program. Perhaps this type of assistance would be premature for some areas at this time but a number of communities, such as Los Angeles, Milwaukee, and Philadelphia—there are quite a few others—have progressed sufficiently with their planning that a pilot program can be instituted to determine the values and the best methods to carry it out. I would like to see the pilot program instituted at the earliest date possible and feel sure every local agency would be pleased to cooperate in making it work here in southern California.

Thank you very much.

Now, Mr. Chairman, if there are no questions on the preliminary statement, I do have about a 10-minute report which is the recommendations of the Los Angeles County Board of Supervisors for your committee.

Mr. HOLIFIELD. You may proceed.

Mr. EARL. Will you distribute those for the record and press, please?

Mr. HOLIFIELD. You may proceed, sir.

Mr. EARL. Thank you.

This is the letter of transmittal, dated May 28, 1956:

Subject: Civil-defense hearing, May 28, Los Angeles.

Hon. CHET HOLIFIELD,
Chairman, Military Operations Subcommittee,
Committee on Government Operations,
House Office Building, Washington D. C.

DEAR SIR: In connection with the hearings on civil defense in Los Angeles on May 28 and 29, hte Los Angeles County Board of Supervisors is appreciative of the opportunity offered in furnishing testimony in respect to the Los Angeles County civil-defense organization and operations.

In compliance with the suggestion made in your letter of May 17, 1956, the attached specific recommendations are made in behalf of the supervisors for consideration of the committee and of the Federal departments concerned.

It is our hope that the Congress will be able to provide the necessary legislation and leadership in order that the recommendations will bear fruition as there is no question that the country's civil-defense preparedness will be advanced by gaining this added Federal support.

Very truly yours,

HOWARD EARL,
Director, Civil Defense.

The heading on this is: "Los Angeles County Disaster-Civil Defense Authority Recommendations to House Military Operations Sub-Committee, United States House of Representatives."

The date is May 28, 1956.

GENERAL

The resources required to carry out disaster and civil-defense operations are overwhelmingly local in situs and control and, necessarily, the responsibility and authority to plan for and to conduct operations belongs to local governments. Overall technical advice and guidance from FCDA is essential, not only because disaster may be regional or nationwide in scope out also because localities cannot always have free access to facts and technical implications basis to necessary plans an doperations.

1. CURRENT PROGRAMS OR ACTIVITIES

(*a*) *Scope and expansion of existing programs*

The Federal program should be expanded particularly in two regards:

First, increased financial assistance should be provided in consideration of the national interest. Everyday civil-defense activity need not necessarily be subsidized (e. g., staff salaries, routine expenses, and supplies), but exceptional resource requirements attributable to the new significance attached to civil defense should be liberally subsidized by FCDA (e. g., "escape" highways, radiological and communications equipment, public shelters, etc.). Standards of required resources should be the only limitation; FCDA should have authority to participate in financing all resource needs of a locality so long as the standards are not exceeded, and should not be limited to the present 50 percent of cost.

Secondly, an expanded FCDA program of providing promptly technical data and popularized educational materials would be appropriate. There is a great unfilled need for understandable and usable technical information from the viewpoint of the average citizen.

b. Effectiveness of Federal administration

FCDA should have less concern for program details of local civil-defense agencies. FCDA's concern should be with local conformance to general national policies, and with whether required resource standards are being exceeded. A nationwide uniformity in the detailed development of civil defense is impossible, and probably undesirable. All current tendencies of nonlocal agencies to exercise authority without exercising responsibility should cease.

A related detail may be mentioned: Some new procedure should be adopted of committing contingently Federal funds for short periods—periods long enough only to allow local governing bodies to appropriate local funds with the prior assurance of FCDA matching funds.

Mr. HOLIFIELD. Will you please explain that, Mr. Earl? I do not quite get the point in that.

Mr. EARL. Yes, Mr. Holifield, I will be very happy to.

Under the current program in California, the local government is required to appropriate the moneys for the purchase of civil-defense equipment and have it in their budget before the application for matching funds is accepted by the State and started through the channels to the FCDA.

And what we are asking is that a contingent appropriation be indicated by FCDA so that we can go to our local governing boards or city councils, as the case may be, and tell them that FCDA has ap-

proved the matching fund on this purchase, and thereby secure the approval of the local governing board.

Mr. HOLIFIELD. Now, if I understand you right, you are asking that the FCDA, whose budget actually is prepared more than a year in advance——

Mr. LIPSCOMB. 18 months.

Mr. HOLIFIELD. More than a year in advance, or around 18 to 20 months in advance, that they appropriate a lump sum on a contingent basis, which would be available to each State for matching purposes?

Mr. EARL. We would make an application ahead of the local budgets to find out if the FCDA would approve the appropriation, or the matching-fund application, I mean.

Mr. HOLIFIELD. The trouble is now that you have to find out how much money you can spend on the local basis and then go to FCDA and find out if they have enough to match it; is that true?

Mr. EARL. The trouble is now that we have to take a gamble on it. In other words, we go ahead——

Mr. HOLIFIELD. In other words, you want the Federal Civil Defense Administration to take the gamble, and not you?

Mr. EARL. No. We just want the assurance from the FCDA that our application is a proper application and is entitled to matching funds, and then their statement to the effect that, provided the application is filed by a local government, it would be eligible for the matching fund money that the FCDA has in its contingent budget.

Mr. HOLIFIELD. Could that be arranged by the setting up of standards on which these funds would be granted for a different function, such as communications, or stockpiling of medical supplies, food, and other items?

Mr. EARL. FCDA has provided us with a very fine set of specifications for most of our civil-defense material. In addition, they have a very broadminded policy of acceptance of new material into the field in which local governments will make a specific application for consideration of an individual item, for instance, which does not show in the standard specifications, but——

Mr. HOLIFIELD. Your real trouble is that it is a gearing of the local budget to the FCDA budget?

Mr. EARL. That is correct. We on the local level have considerable trouble in selling the investment in civil defense equipment to our local legislative bodies, on occasion. They will not buy it for us if they know we are going to have to pay 100 percent of the cost.

But if they know that the Federal Government will reimburse us for 50 percent of the cost, then they have a little different feeling, which is more favorable to us directors.

Mr. HOLIFIELD. All right, you may proceed.

Mr. EARL. Yes. [Continuing:]

(c) *Improvement through change in responsibility or control*

It would seem that the Federal Government's fiscal interest in subsidized civil-defense resources is properly protected by State and local mutual aid agreements, and therefore there is no reason for "essential control" to rest with the Government providing the most financial support.

(d) *Adequacy of Federal field personnel*

If a technical adviser would be assigned by FCDA permanently to each target area, local preparedness undoubtedly would be expedited.

Previously in this testimony I have told you that that person has been furnished us. So you have already anticipated a board of supervisors' request and allowed it, apparently. [Continuing:]

2. LEGISLATIVE, ADMINISTRATIVE, OR OTHER METHOD FOR OBTAINING LONG-RANGE SOLUTIONS

(a) Suggested changes in legislation

Federal legislation making surplus property available to civil-defense agencies would be helpful.

Mr. HOLIFIELD. We have already anticipated that in the House and it is now resting in the Senate. On the above "adequacy of Federal field personnel, "you gave us credit for that. We are not entitled to that. That is an administrative decision of FCDA. We will take credit for the second one, though.

Mr. EARL. Excellent. I will report back to the board on that, sir. [Continuing:]

(b) Suggested changes in administrative measures

Civil defense organization consistent with East River project report is still required and is lacking generally; artificial nonpeacetime organizations must be eliminated; a metropolitan civil-defense authority or district may be the only answer for many target areas.

Mr. HOLIFIELD. Now, before you go on, what do you mean by "artificial nonpeacetime organization must be eliminated"?

Mr. EARL. Well, since the existence of civil defense in the State of California, in the State organization setup that we have had since 1950, an area like Los Angeles County has been divided up into what has been called an operational area in which county territory is isolated from the county government, and an attempt is made to attach it to other communities in the particular area for operational purposes.

It is not a situation that exists in normal government. It is a change made for civil defense to operate in an awkward organization which the personnel of the governments and the people themselves are not used to, and does not bode itself for a successful operation in an emergency.

Mr. HOLIFIELD. Now, let me be clear——

Mr. EARL. That is what they are talking about.

Mr. HOLIFIELD. This does not concern a Federal prerogative in any way? Is not this a volunteer arrangement within your own county, and possibly existing counties and cities?

Mr. EARL. That is true, except in the latter part of the statement, and that is, which has to do with the metropolitan civil-defense authority or district. If it crosses States lines, of course, it would be Federal in nature. If it remains within the State, then it is a State matter; yes, sir. It would be a State legislative matter, in all probability.

Mr. HOLIFIELD. Then, as a matter of fact, if such an authority is desired, that is clearly within the prerogative of the State legislature to make that——

Mr. EARL. As long as——

Mr. HOLIFIELD (continuing). To make that an entity, and then under the present arrangement of liaison between the Governor's office

and the Federal Civil Defense Administration, there could be liaison in that manner, could there not?

Mr. EARL. Yes, sir; there could be. And there is part of your target area planning that we were just discussing.

Mr. HOLIFIELD. Yes.

Now, in the case of overlapping of State lines, such as we now have in the East——

Mr. EARL. In New York State, Connecticut, and New Jersey.

Mr. HOLIFIELD. Yes. That is a matter of a tri-State agreement.

By the way, we are going to have someone appear before the committee and testify to that tri-State arrangement that they have back there.

But you are not faced with that here.

Mr. EARL. We are not faced with that here as yet; that is right.

Mr. HOLIFIELD. So this particular suggestion here is one that is within your own power.

Mr. EARL. Yes. But it has its implications leading into your target area planning that we are devoting so much time to at this particular time in FCDA and in the hearing.

Mr. HOLIFIELD. All right; you may proceed.

Mr. EARL (continuing):

(c) *Suggested other methods for long-range solutions*

It would appear that the State should be given more actual power and administrative responsibility with reference to Federal assistance; that FCDA should protect the Federal interest more through postaudit and the establishment of standards, along the lines followed by older Federal programs, such as welfare and public health.

3. ADDITIONAL COMMENTS OR SUGGESTIONS

Public Law 875 (disaster relief), as amended, should be made more specific in its provisions and leave less to arbitrary administrative decision.

Mr. HOLIFIELD. Now, Mr. Earl, we are going to have to conclude the testimony for today at this point because of other commitments which some of the members have made. I will confer with you right after adjournment with regard to continuing your testimony.

Mr. EARL. Fine, sir. Thank you.

Mr. HOLIFIELD. The plan for the committee is to assemble in this room at 10 o'clock and reconvene.

Mr. EARL. Mr. Chairman, before you do adjourn, you will notice that the file I gave the committee was the one intended for the entire session. Now, the last portion of the file from this point on is material which will be coming up in your sessions which follow.

Mr. HOLIFIELD. Yes.

The meeting is adjourned.

(Whereupon, at 4 p. m., the subcommittee adjourned to reconvene at 10 a. m., Tuesday, May 29, 1956.)

These figures almost certainly could never be duplicated exactly in another shot. And that is why, for planning purposes, they are just as good as any other set of figures you can come up with.

Mr. HOLIFIELD. Does not that indicate that if evacuation of 1 million or 2 million people of a city like Los Angeles were attempted, that as long as they were in the open aboveground, and if they happened to be in the area of fallout or the downwind area of fallout, they would be subject to these degrees of contamination?

Dr. BELLAMY. Yes, sir; they would.

I think we are in the area of a tremendous calculated risk, and it is quite certain that people in the open, and within the first 2 or 3 hours postdetonation, from these large thermonuclear weapons, are going to receive enough radiation to be very serious, probably killing.

As to what the proper countermeasure is, that is a separate question. As I shall state a little further on, the maneuver of choice, as I see it, at this time is what I would call a combined dispersal-shelter-cover program, a combination program for many different reasons, not the least of which is an economic reason.

We could almost break the Nation if we tried to spend enough to cover everybody deep enough. On the other hand, at considerable distances from weapon detonation, rather light cover is the main precaution.

Mr. HOLIFIELD. Now, I wish to pose a question to you, because a statement has been made before this committee that anyone in a prepared shelter within 20 miles of a 10-megaton explosion would be in a death trap.

Dr. BELLAMY. Not unless he is scared to death, Mr. Chairman. [Laughter.]

Mr. HOLIFIELD. I see.

Dr. BELLAMY. With an adequate shelter——

Mr. HOLIFIELD. Now, let us consider what we mean by the word "adequacy." You have stated that it would bankrupt the Nation to give the expensive type of shelter which I assume you mean would protect one from being either under the fireball or within a very close distance to the fireball.

I am inclined to agree with you on that statement, if that is what you mean.

Dr. BELLAMY. Yes. Let me approach it this way, Mr. Chairman——

Mr. HOLIFIELD. By the way, am I anticipating your statement?

Dr. BELLAMY. Well, only in part. My statement is really very compact, and every part of it could be expanded a good deal.

Let us not talk at all about the black area, for a 20-megaton weapon, an area some 5 miles across. I think you call it the A area there. Let us not talk about it at all.

Mr. HOLIFIELD. Just a minute. We will get a chart, Doctor, so that we can demonstrate it.

Mr. BALWAN. This for a 20-megaton weapon has an area of the A zone of complete destruction, within a 5-mile radius.

Dr. BELLAMY. That is right. That is the part we do not need to talk about here.

Now, the part that becomes difficult is in the next ring.

Mr. HOLIFIELD. In what we call the B ring?

First, this was in connection with the problems of the Manhattan Engineering District, in connection with their processing of nuclear materials, and since 1949, it has been in connection with the effects of atomic weapons themselves at the Naval Radiological Extension Laboratory here in San Francisco.

Mr. HOLIFIELD. We will be glad to hear from you, Dr. Tompkins.

Dr. TOMPKINS. Thank you.

Mr. Chairman, with your permission, I have with me an excerpt from a short statement of the technical position of the radiological defense which I made about January 1955, which I feel it might be pertinent to insert in the record, although it is perhaps not necessary to read it at this meeting.

Mr. HOLIFIELD. We will be glad to receive it.

Dr. TOMPKINS. Thank you.

(The summary above referred to is as follows:)

SHORT SUMMARY OF THE RADIOLOGICAL DEFENSE TECHNICAL POSITION

Paul C. Tompkins, United States Naval Radiological Defense Laboratory, San Francisco, Calif.

1. The general picture seen from an analysis of existing information on fallout from thermonuclear weapons may be summarized as follows:

(*a*) Radioactively contaminated areas can be expected to be encountered with sufficient frequency and at sufficient gamma intensity levels to demand direct countermeasures.

(*b*) Existing facilities and equipment are not adequate to provide the necessary protection.

(*c*) Areas which can be affected are too large to permit use of evacuation or avoidance of a radiological area as the predominant control measure.

(*d*) Protection of both personnel and installations from the initial and subsequent effects supersedes recovery as a primary objective. Alternatives to protection and recovery from the effects of the event decrease as areas affected increase.

(*e*) The primary countermeasures system must be based on provision of sheltered living areas with shielding for protection against the gamma radiation, and recovery through preprotection of an installation, or its subsequent decontamination.

2. The objective of countermeasures studies is to arrive at a determination of the provisions that must be made to permit people to live through a contaminating event, and still perform essential functions. This implies that not only must one deal with the effects of radioactive contamination under emergency conditions, but one must also know how to live with radioactive contamination under long-term exposure conditions.

3. Let us now turn to a consideration of the essential elements of countermeasures systems. These elements are:

(*a*) Reduction of gamma radiation intensities by shielding.

(*b*) Reduction of gamma radiation fields caused by loose radioactive weapon debris by removal of such debris. This includes both postevent reclamation methods and protective measures such as the "washdown" system employed by the Navy.

(*c*) Reduction of ingestion, inhalation, and beta radiation burn hazards by the use of proper doctrines, clothing, respirators, and effective decontamination.

(*d*) Reduction of dosage by control of exposure time. This requires an intimate knowledge of time and motion involved on the part of personnel, and an equally intimate knowledge of the radiation intensity and radiological conditions under which these personnel must operate.

(*e*) Exclusion of contaminated material from critical areas such as those designed for occupancy, food and water sources, etc.

The first requirement of countermeasures is to provide enough protection to permit survival during the acute phase immediately following a detonation This must be done primarily through an adequate shelter program. Such shelters must provide a shielding factor of the order of 1,000, if military forces are to retain the capability of operating despite the presence of fallout.

4. The second requirement is to establish the capability of recovering and occupying the affected regions as normally as possible. To do this it is necessary that "living areas" be designated. These areas must have maximum shielding, and provisions for excluding the entry of radioactively contaminated material. This requirement must be met if dosage control is to be possible. It is from these centers that personnel would then emerge into the surrounding contaminated area to discharge their assigned duties. The decontamination of "work areas" will be a requirement in many cases. The provision of clean food and water supplies will be the predominant practical problem encountered in this phase. The acceptance of a single, sublethal acute dose as the criterion of acceptable dosage is not sound practice. It is required that a new set of medical standards be developed to cover continued exposures at various rates, comparable to the 30 roentgens per 2 years which is the current standard for peacetime operations permitted by the Navy. Criteria for properly prorating the revised acceptance doses are needed.

5. Unlike industrial practices, fallout influences the environment. Although this fact does not affect the currently practiced principles of radiological procedure, there are drastic practical influences on the conditions to which these principles are applied. Table I illustrates some of the more obvious differences brought about by the radiological effect on environmental conditions. Notice that only items 9 and 10 stay the same under the two situations.

TABLE I.—COMPARISON OF FALLOUT VERSUS NONFALLOUT CONDITIONS ON RADIOLOGICAL PRACTICE

PEACETIME (NON-FALLOUT CONDITIONS)	FALLOUT AREA
1. *Environment clean.*—Radioactive materials restricted to limited areas and/or conditions. *Objective.*—Keep activity greater than background confined to sharply limited regions.	1. *Environment contaminated.*—Clean areas restricted to those protected in advance. *Objective.*—Keep activity out of critical localities.
2. Shielding around the source.	2. Shielding around the person.
3. Control points at entry to confined area. Time in restricted area limited.	3. Control points at exit from confined area. Time in environment limited.
4. Contamination monitoring done under low and constant background conditions.	4. Contamination monitoring done under high and variable background conditions.
5. Food supply unlimited and generally not exposed to contamination.	5. Food supply sharply limited and generally exposed to contamination.
6. Clean water supply not limited.	6. Clean water supply very limited.
7. Material control requirements increase with increasing specific activity and total activity.	7. Personnel contamination protective measured increase with increasing specific activity and total activity.
8. Requirement for exposure limited to few people under good administrative control.	8. Requirement for exposure affects many people not under administrative control.
9. Assume things in contaminated area are affected until proven clean.	9. Same.
10. Acceptable dosage/unit time decreases with increasing frequency and duration of exposure.	10. Same.

Dr. TOMPKINS. The reason why I think it might be valuable is that it gives the technical reasons for and the implications of this inside-out philosophy, which, of course, was the immediate reaction of our laboratory to the expanded scale of thermonuclear weapons as contrasted to these smaller fission weapons.

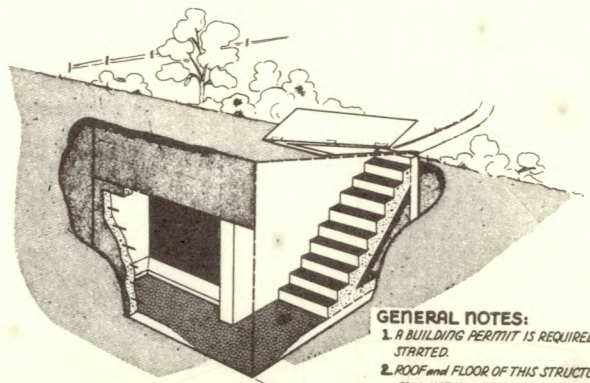
Mr. ROBACK. Does this statement that you have submitted sum up some basic concepts and countermeasures?

Dr. TOMPKINS. No; it does not really do that. It simply gives a general summary of the things that really affect radiological defense.

Radiological Home Shelter

(COST UNDER $1000)

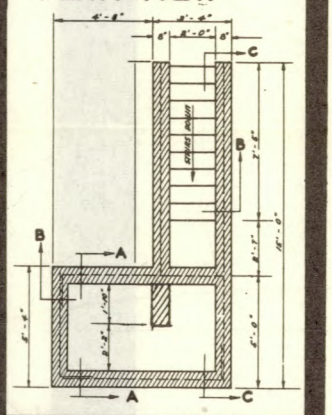
THE SKETCH BELOW IS THAT FOR A RADIOLOGICAL FALLOUT PROTECTION SHELTER. BUILDING AND SAFETY PERMITS ALLOW CONSTRUCTION ANYWHERE WITHIN LOS ANGELES COUNTY. *However*, THE COUNTY DISASTER-CIVIL DEFENSE AUTHORITY RECOMMENDS IT FOR CONSTRUCTION ONLY BEYOND 11 MILES FROM A POSSIBLE BOMB DROP AND ON THE LEE-SIDE OF THE PREVAILING WIND AREA - THE MOST LIKELY FALLOUT AREA.



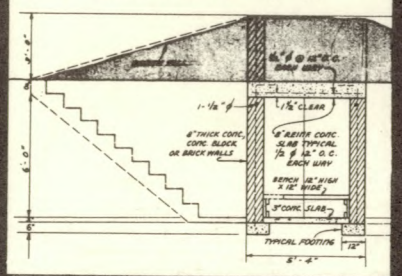
GENERAL NOTES:

1. A BUILDING PERMIT IS REQUIRED BEFORE CONSTRUCTION IS STARTED.
2. ROOF and FLOOR OF THIS STRUCTURE TO BE CONCRETE 1-2½-3½ MIX, USE TESTED CEMENT. MAX. 7½ GALS. OF WATER PER SACK.
3. WALLS MAY BE THE ABOVE MIX OF CONCRETE, OR CONCRETE TILE BLOCKS WITH ALL CELLS GROUT FILLED, OR BRICK MASONRY.
4. REINFORCING STEEL AS SHOWN, TO CONFORM WITH A.S.T.M SPEC'S A-15-39 and A-305
5. MORTAR 1-3½, MAX. ¼ PART LIME PUTTY.
6. GROUT, SAME MIX AS MORTAR BUT FLUID CONSISTENCY, OR 1-2-2 MIX PER GRAVEL CONCRETE, FLUID CONSISTENCY.
7. ROOF FORMS TO REMAIN IN PLACE 7 DAYS AFTER SLAB IS POURED.

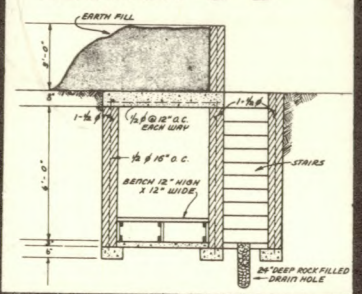
PLAN VIEW



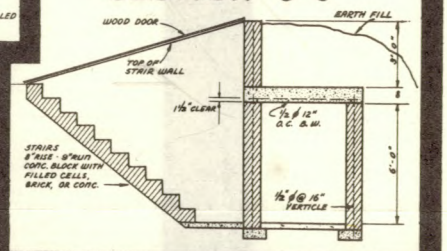
SECTION A-A



SECTION B-B



SECTION C-C



NOTE:
THIS STRUCTURE IS NOT PRESUMED TO GIVE ABSOLUTE PROTECTION, BUT IS DESIGNED IN ACCORDANCE WITH THE RECOMMENDATIONS GIVEN IN F.C.D.A. HOME SHELTER TM 5-5

COUNTY OF LOS ANGELES
DISASTER-CIVIL DEFENSE AUTHORITY

AK

EXHIBIT 3

RADIOLOGICAL DEFENSE MEASURES AS A COUNTERMEASURE SYSTEM

Research and Development Technical Report USNRDL-TR-74, NS083001, February 15, 1956, by W. E. Strope

General, Technical Objective AW-5c

Military Evaluations Group

W. E. Strope, Head

Scientific Director, P. C. Tompkins

Commanding Officer and Director, Capt. R. A. Hinners, United States Navy

UNITED STATES NAVAL RADIOLOGICAL DEFENSE LABORATORY

SAN FRANCISCO, CALIF.

ABSTRACT

The importance of considering radiological defense measures as an interrelated system rather than as a collection of individual measures is emphasized. In discussing the radiological defense system, the defense problem is divided into three time phases: Emergency, operational recovery, and final recovery. The objectives and measures of effectiveness in each phase are discussed. Countermeasures are classified as to type. The concept of a central countermeasure type in each phase is introduced. Central countermeasures are selected and their interactions are discussed. It is concluded that failure to recognize the interactions between countermeasures is resulting in development of countermeasures on incompatible grounds.

SUMMARY

THE PROBLEM

Historically, radiological-defenses measures have been developed individually to meet specific problems arising from contaminating atomic attack. These countermeasures must be integrated as a system if an effective defense is to be achieved. The purpose of the study is to describe an integrated system and to point out interrelations that are important to performance specifications for countermeasures.

FINDINGS

Radiological defense is an important part of passive defense. The overall objective of passive defense is to minimize the effects of attack on operations. Three time phases are apparent: Emergency phase, operational recovery phase, final recovery phase. The objectives in each phase are respectively. Survival, early recovery of essential functions, ultimate recovery of normal functions. In everyday language, these objectives on a national scale are survive, stay in the war, and win the peace.

The large number of possible countermeasures fall into a limited number of countermeasure types. These types are rated qualitatively on feasible effectiveness and range of application. The outstanding countermeasure type in each phase is proposed as the central countermeasure for the phase. These are: For the emergency phase, shelter; for operational recovery, reclamation; for final recovery, indeterminate at present. The system hinges on the central countermeasures, the other important countermeasure types being regarded as peripheral to the central countermeasures.

The importance of interactions of countermeasures stems from the fact that personnel exposure to nuclear radiation is limited if casualties or other unwanted effects are to be avoided. The limiting exposure must be rationed over all three phases of the system. Thus, shelters cannot be designed simply for survival. If

such is done, the subsequent phases become very costly or impracticable over large areas of the target. Shelter specifications must provide for more than bare survival; how much more depends on the nature and effectiveness of the remainder of the system. System implications are therefore an important consideration in specifying countermeasure performance.

ADMINISTRATIVE INFORMATION

This is part of a general evaluation of countermeasures being studied under Bureau of Ships Project No. NS083001, Technical Objective AW-5c.

CONTENTS

ILLUSTRATIONS

SECTION 1. INTRODUCTION

1.1 Purpose

Historically, radiological defense measures have been developed individually to meet specific problems which would arise from contaminating atomic attack. To a large extent, this process has been inevitable, since both knowledge and understanding of the defensive aspects of atomic warfare have been acquired on a piecemeal basis through weapons tests, laboratory experiments, and operational analyses. If an effective and efficient defense is to be achieved, however, it is extremely important to approach radiological defense as though it were a system of interrelated countermeasures. The purpose of this report is to summarize the radiological defense system as it appears at this time and to point out the interrelations that are not being sufficiently accounted for in much of the present defense effort.

1.2 Scope

Radiological defense is a part of passive defense. Passive defense consists of measures taken to reduce the probability of and to minimize the effects of dam-

age caused by hostile action, without employing active weapons or initiating offensive action.[1] In other words, passive defense starts with the assumption that the weapon will be delivered to the target. Its purpose is to minimize the effects of the attack upon our operations. As a result of the development of larger nuclear weapons and also of an increased knowledge of the offensive capabilities embodied in various ways of using nuclear weapons, the contaminating atomic attack has become increasingly probable. Therefore, radiological defense has become an increasingly important part of passive defense. This report will be applicable to the general problem of passive defense against atomic attack, to the extent that contaminating atomic attack becomes the preferred way of using the nuclear weapon.

SECTION 2. CHARACTERISTICS OF RADIOLOGICAL DEFENSE

2.1 Phasing of the defense problem

The possible range of atomic-attack situations that may occur in a future war is so large that meaningful statements of a completely general nature are difficult to make. Laurino[2] has pointed out that specific statements about countermeasures require careful definition of the situation of interest, and has proposed to achieve this definition by consideration of three properties of the situation: the nature of the attack, the nature of the target, the operational period of interest. The more specific a statement must be, the more detailed the description of these three properties must be.

For an appreciation of radiological defense as a general countermeasure system, it is important and productive to differentiate between the operational periods of interest; that is, to time phase the radiological defense problem. The reason that such phasing is useful is that the local objectives of these phases are quite different, and therefore the countermeasures involved in each phase and their measures of effectiveness are distinct. Radiological defense appears to fall naturally into three time phases[1,2,3] which may be designated as emergency phase, operational recovery phase, and final recovery phase. The time periods involved cannot be rigidly defined and in some situations the phases may not be sharply differentiated. In general, however, the emergency phase begins upon warning of attack, if such occurs, and lasts for several days to a week after attack for nontactical targets. Where tactical targets are involved, the emergency phase may last only minutes or hours after attack. The operational recovery phase follows the emergency phase and may last for months or years, perhaps for the duration of hostilities. The final recovery phase follows the operational recovery phase and persists for an indefinite period. Because it is desired to treat radiological defense as a general system applicable to all contaminating attacks and to all targets, the detailed description of these characteristics will be avoided. However, specific examples will be introduced with emphasis on defense of the continental United States.

2.2 Phase objectives

The objective of the emergency phase is survival. Since nuclear radiation is an antipersonnel effect, the objective of this phase in radiological defense is simply the survival of personnel. In the larger framework of passive defense, it extends to survival of facilities. Footnote 1 defines emergency measures as actions "taken to keep loss of life and property to a minimum." Similar expressions of objective occur in civil-defense literature.

The objective of the operational recovery phase is to regain the military usefulness of the target as soon as possible. Footnote 1 refers to operational recovery measures as "steps taken to restore the essential utility of an activity." Reference 4 also regards this phase as the process of restoring essential functions. When one recalls the overall objective of passive defense—to minimize the effects of the attack on operations—it can be seen that the local objective of the emergency phase is not sufficient. In addition to survival, passive defense must minimize the interruption of essential war functions caused by the attack.

It is due to an accident of history that consideration of the radiological defense problem began with the operational recovery phase. Contaminating atomic attacks have been observed only at weapons tests. Personnel are carefully excluded

from the target area during the test detonations. Upon reentry, test personnel have encountered large contaminated regions that restrict and deny their operations under the rigid safety precautions prevailing at the test site. Later analysis of the test results reveals that a somewhat smaller but still important region would deny operations even under wartime conditions. Thus, the denial aspect of the contaminating event or fallout has been clearly evident. Early efforts in radiological defense were concerned with this problem, beginning with attempts to recover the usefulness of the target ships contaminated at Operations Crossroads. On the other hand, experience with the noncontaminating or high air-burst attack began at Hiroshima and Nagasaki. These were occupied targets and the attacks caused great numbers of casualties. For a long time, the problems of survival under atomic attack were associated rather closely with the high air burst. Although small groups concerned with radiological defense have attempted periodically to question this concept, it has been comparatively recently that the problem of survival under contaminating attack has been recognized in its true magnitude. The unintentional exposure of a considerable group of people to fallout from a detonation in Operation Castle was instrumental in bringing about this recognition.

The objective of the final recovery phase is to restore the normal or preattack situation in the target. This phase of radiological defense has not received much attention until recently. It has been recognized as a necessary long-term rehabilitation effort following a war, but its connection with military problems has seemed remote. With the production of significant numbers of superweapons, the prospect has arisen that a full-scale nuclear war may result in contamination of a large part of the continental U. S. In this event, many features of our society, such as normal agriculture, may be in peril. This problem has military significance in that military operations are ultimately conducted to achieve the national war aim of preserving our way of life. If we win a nuclear war at the sacrifice of our way of life, the national war aim is not achieved. Consequently, the need for incorporating this objective in the countermeasure system to achieve the overall objective of passive defense has become increasingly real. In summary, the overall objective of radiological defense—to minimize the effects of nuclear radiations on operations—appears to involve the successive objectives of survival, rapid recovery of essential functions, and ultimate recovery of normal functions.

2.3 Measures of effectiveness

In order to compare countermeasures and to evaluate a countermeasure system, it is necessary to choose a quantitative measure of the effectiveness of the countermeasures or system in achieving the objective. Having defined the objectives of the three phases of radiological defense, it is of interest to note the measures of effectiveness that suggest themselves in each phase.

2.3.1 Measure of effectiveness in emergency phase

Since the objective of the emergency phase is survival, the appropriate measure of effectiveness of countermeasures in this phase appears to be the number or proportion of survivors. The optimum countermeasure system in this phase, then, is one that maximizes survivors or, alternatively, one that minimizes casualties. Optimality also contains the idea of cost; that is, the balancing of effectiveness against cost. Hence, one might compare countermeasures or countermeasure systems in the emergency phase on the basis of reduction of casualties for comparable cost or on the basis of least cost for an acceptable casualty level.

In attempting a comparison of this type, it is, of course, important to define the term "casualty." Used as above as the pure opposite of survivor, casualty must be defined as a lethality. As pointed out previously, a specific evaluation requires a detailed knowledge of the situation. In many situations, a sick person cannot be considered a survivor for practical purposes. A casualty might then be defined as a "combat noneffective" or some similar term. Again, time may play a significant role, as in most tactical situations, so that the casualty may be a "noneffective within 2 hours." In general, however, reduction of casualties will be the preferred criterion, defined in terms consistent with the situation.

2.3.2 Measure of effectiveness in operational recovery phase

The objective in the operational recovery phase leads one to a consideration of the delay time or denial time caused by the attack before essential functions are once more operable. To minimize the effects of the attack on operations, it is desired to minimize this delay in resumption of operations. The time after attack at which essential functions are regained is called "mission entry time."[3] Mission entry time thus becomes the general measure of effectiveness of countermeasures in the operational recovery phase. We can compare countermeasure systems in this phase on the basis of earliest mission entry time for comparable cost or, alternatively, on the basis of least cost for an acceptable mission entry time. It is worth while to point out that the criterion of acceptability will vary with the nature of the target. For example, delays of a week or so might be acceptable in nontactical targets while the acceptable delay in tactical targets may be a matter of minutes.

There are other possible measures of effectiveness in the operational recovery phase but these imply a different objective for the phase. Use of the casualty reduction criterion requires that the objective be the conduct of operations at a given time and for a stated period with a minimum of casualties. Stay time may also be used as a measure if the objective is rephrased to involve the recovery of operations at a stated time for as long as possible. However, stay time and acceptable casualty level usually being fixed by the mission of the target, it has been found that emphasis in the operational recovery phase is on minimizing the denial period.

2.3.3 Measure of effectiveness in final recovery phase

The understanding of the final recovery phase at the present time is considerably more vague than the understanding of the first two phases because of the small amount of information available. Certainly, the major characteristic of the objective is "normality." It is desired to minimize over a long period the deviation from normal operations. In radiological defense, one must consider the long-term effects of radiation on humans—such as incidence of cancer, changes in the blood, shortening of the life span, and even genetic effects on future generations. These long-term effects must be minimized, and inevitably acceptable deviations from the normal must be established. Then, countermeasures for this phase can be evaluated.

SECTION 3. CHARACTERISTICS OF COUNTERMEASURES

3.1 Countermeasure types

When we survey the countermeasures available or proposed for use in atomic defense, we are faced with an astonishing collection of possibilities. This large number of individual countermeasures fall into a much smaller number of countermeasure types—dispersal, damage control actions, shelter, reclamation, and the like. Within each type are individual actions, each with its characteristic performance and cost. In developing a countermeasure system, it is fruitful to look at the general potential of the countermeasure types. Some are inherently more valuable than others in achieving the objective.

3.2 Potential value of countermeasure types

The potential value of a countermeasure type in passive defense appears in two general characteristics. The first of these is the feasible effectiveness of the types. In practical application, all countermeasures have limitations. Countermeasures that completely achieve the operational objective and thus reduce the effectiveness of attack to zero appear to exist only in theory. In some cases this is because the costs entailed are beyond the defense capabilities. For example, complete protection or shelter of all facilities and personnel in a large target may be a good theoretical solution but may entail costs both direct and indirect that are clearly beyond the practical capability. In other cases, there are real limitations in the attack situation regardless of the effort available. A most obvious example is rescue and medical aid after attack. Since an attack will cause a large number of casualties almost immediately, the feasible effectiveness of medical aid is limited to that fraction of the survivors whose fate could be altered by the existence of adequate medical aid.

The second characteristic is that of range of application. It should be recalled that passive defense situations can be defined in terms of three properties: The

nature of the attack, the natufe of the target, the operational period of interest. In time phasing the defense problem, we have accounted only for the latter property. In each phase, we must look at countermeasure types with regard to their applicability in terms of attacks and targets. A universal countermeasure is one that maintains its effectiveness over the complete range of attacks and in all targets. Again, in practice, the universal countermeasure does not seem to exist. But some countermeasure types approach the ideal very closely.

3.3 Central and peripheral countermeasures

In developing a countermeasure system, it appears reasonable to place emphasis on the countermeasure types of greatest potential, as expressed in terms of feasible effectiveness and range of application. Any other approach would result in a specific grouping of countermeasures for each special situation. Not only would there be a different countermeasure system in each target, but also perhaps several systems to cover the range of possible attacks. This is manifestly inefficient. Some "tailoring" of a general countermeasures system must undoubtedly occur in each target because of differing conditions or requirements; but if the defense is to be well founded, deviations from a general system should be done only for good and sufficient reasons. Furthermore, it would be found generally that the tailoring process will occur in the choice of specific actions within a countermeasure type, rather than in the choice of a countermeasure type.

When countermeasure types are compared with respect to the objective of each radiological defense phase, it may be found that one type stands out from the rest in potential value. That is, it possesses characteristics of feasible effectiveness and range of application that distinguish it from other countermeasure types. If such is the case, this type of countermeasure should form the keystone of the countermeasure system. We may call such a countermeasure type the central countermeasure. It so happens that the central countermeasure can be determined in each phase of radiological defense.

Once the central countermeasure is selected, the remaining countermeasure types may be regarded as peripheral countermeasures. Peripheral countermeasures are found to possess one or more of the following characteristics:

(*a*) The feasible effectiveness of the countermeasure type is relatively low.

(*b*) The range of application is limited to a segment of possible defense situations.

(*c*) The effectiveness of the countermeasure is highly dependent upon the existence of the central countermeasure as a prerequisite.

When a countermeasure type is labeled a peripheral countermeasure, it is not intended to convey the impression that such countermeasures are useless and should not be undertaken. Any effective countermeasure system will include a number of peripheral countermeasures in addition to the central countermeasure. But a peripheral countermeasure does not possess the characteristics necessary to form the hub or keystone of the system.

The term "central countermeasure" has been chosen to convey the notion that such a countermeasure type represents the core, heart, or essence of defense in the particular time phase of radiological defense. Peripheral countermeasures, however important, act in support of and derive support from the central countermeasure. In a sense they revolve about the existence of the central countermeasure. In the following paragraphs, the central coutermeasures are discussed. An exhaustive treatment of the potential value of the various countermeasure types will not be attempted. In fact, the general statements made must be tested in future analyses of a more specific nature and the system described here supported or modified.

3.4 Central countermeasure in the emergency phase

3.4.1 Selection of the central countermeasure

The central countermeasure in the emergency phase of radiological defense is believed to be adequate shelter. The relationship of countermeasures in the emergency phase is shown in figure 1. The feasible effectiveness of shelter in reducing casualties is very high. Shelter is effective against all effects of atomic attack. Relatively simple underground shelters permitted survival near ground zero at Hiroshima. For surface and subsurface detonations on land, the violent movement of earth in the crater region limits the effectiveness of shelters. This region coincides roughly with the edge of the crater lip. Of course, in theory

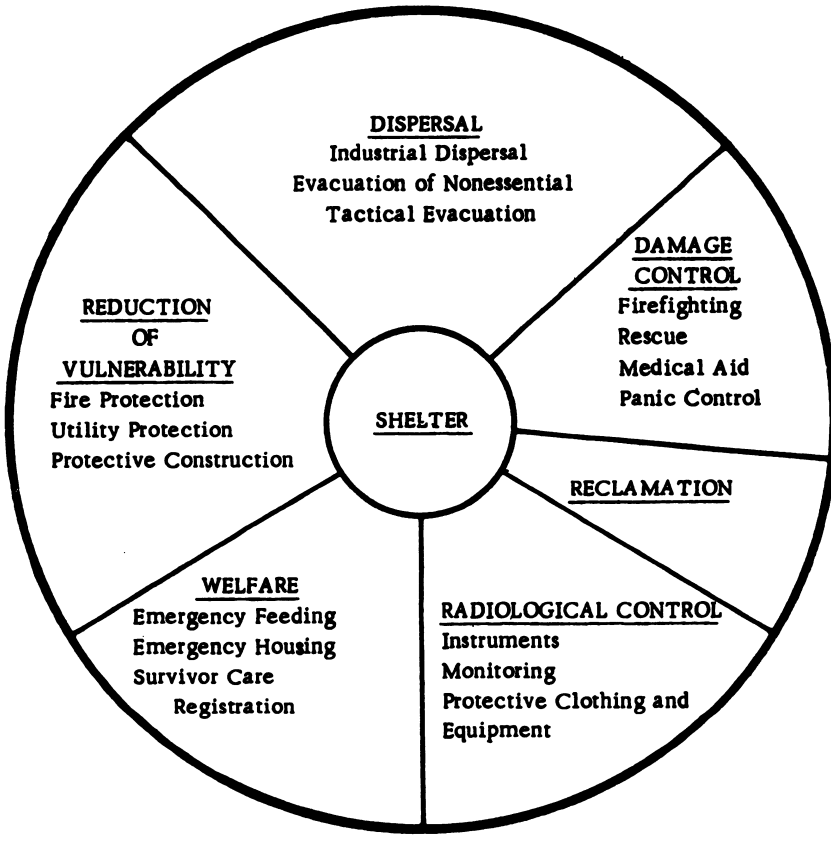


Fig. 1 Countermeasure System in the Emergency Phase

it is always possible to dig deep enough to achieve survival even in the crater region but in most practical cases this goes beyond the defense capability. In general, the region of effectiveness of shelter extends inward to the crater lip. When compared with the region of casualty production without shelter, this effectiveness is very high. If one can, by means of shelter, reduce casualties from high air bursts to zero and confine casualty production for other bursts to within the crater and its lip, one has blunted the major antipersonnel capability of even the very high-yield weapons. Shelter is applicable to practically all land targets, and also to ships and aircraft. The practical limits of shelter effectiveness on ships and aircraft are linked with the survival of the craft, although weight limitations on aircraft may further limit the effectiveness. Most major naval ships contain areas that would permit survival up to the time when the ships would be sinking; many personnel can survive even after abandoning ship.

One additional limitation on the potential effectiveness of shelter is the need for warning. This need can be minimized by the proper location of shelters near or at the normal location of personnel. Again, in theory, the need for warning can be eliminated by making the normal location a shelter. This is a natural trend in tactical targets, such as ships, or gun, or missile-launching emplacements, where minimizing the need for warning is achieved by protecting the operating area or by providing for remote operation. These solutions are

less practicable in nontactical targets, although the placing of vital industries and similar operations underground has occurred.

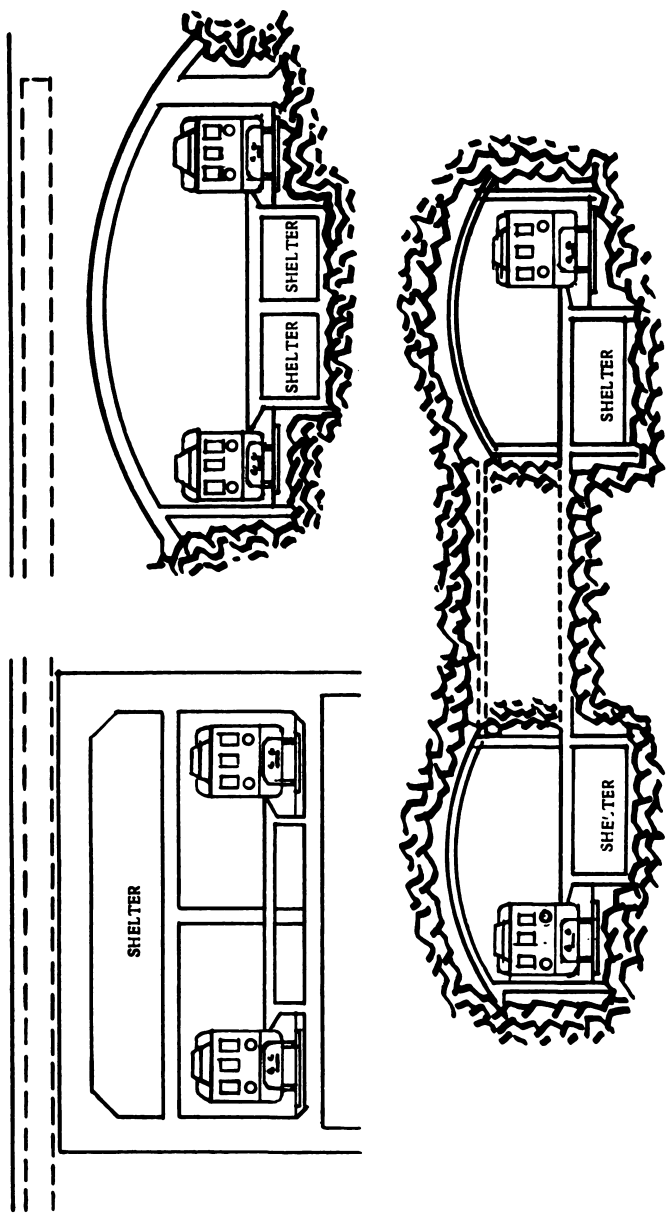
An outstanding example of underground shelter is in Sweden, a nation that has recognized the central nature of shelter and has proceeded to implement this solution. Not only has Sweden undertaken to provide adequate shelter for its urban populations, but also it has placed underground whole industries, ship-operating bases, and repair facilities. Stockholm's new subway has specially designed shelters as shown in figure 2. The Swedish Air Force has at its disposal an impressive number of underground air-defense centers and airplane hangars. Planes start their takeoffs from underground locations. It is believed that underground installations costing $100 million are now in use in Sweden.[6]

3.4.2 Other emergency phase countermeasures

Peripheral countermeasures of considerable importance in the emergency phase include damage-control operations after attack, reduction of vulnerability, and dispersal. The feasible effectiveness of damage-control actions is not well defined. Present capabilities do not appear to have a high potential. For example, it is seriously doubted that conventional fire-fighting techniques can alter the course of fire damage significantly. The ability of the medical facilities to significantly alter the casualty level has also been questioned. Damage-control actions are generally divided into self-help on the part of the target population and mutual-aid support from organizations outside the target area. The effectiveness of self-help measures is obviously dependent upon the existence of adequate shelter, while mutual-aid efforts become much less effective when large areas are affected by high-yield weapons. Under contaminating atomic attack, most of the region where damage-control actions may be effective will be subjected to very high radiological hazards from fallout. The practical utility of organized emergency action may become negligible under these conditions, particularly in nontactical operations. These limitations clearly place damage control in a peripheral relationship to adequate shelter. It is important to note that the postattack operations of damage control, radiological control, and welfare are presumed by many people to represent the heart of atomic defense, particularly in civil defense and passive defense of land installations. Such does not appear to be the case.

The potential value of dispersal is high, perhaps next to adequate shelter in reducing personnel casualties. The limitations of dispersal are twofold. First, the feasible effectiveness of dispersal in sensitive to weapon yield. As larger weapons appear, dispersal distances must increase to be effective. Dispersal is at a particular disadvantage with respect to the contaminating event because of the large areas and distances involved. Superweapons can produce fallout casualties in areas of thousands of square miles. A relatively small number of these weapons could contaminate the whole United States to casualty-producing levels. Under this attack condition, the value of dispersal in radiological defense drops to zero. Second, dispersal on land targets is costly and slow. There are tremendous economic difficulties involved in the relocation of industries and populations. Although some official encouragement has been given to dispersal, the results have been poor. A dispersal distance of 10 miles has been set, but many exceptions have been made in the granting of industry permits for economic reasons. Meanwhile, the development of high-yield weapons has made the 10-mile range of doubtful value. Similar limitations exist in tactical targets. For the foregoing reason, dispersal appears to be a valuable but peripheral countermeasure type.

Because of the difficulties in achieving permanent dispersal, a special type of dispersal known as tactical evacuation is being studied by the Federal Civil Defense Administration. Tactical evacuation involves the dispersal of personnel upon warning to supposed safe areas in the outer reaches of the target. Tactical evacuation suffers not only from the limitations previously discussed but also from the fact that it is applicable to a very limited segment of atomic attack situations. It is practicable only in certain land targets and, even in such targets, requires a long warning period. It is not useful unless such warning exists. Although a warning period of several hours' duration may be achieved during the next few years, it is well recognized that the introduction of high-speed intercontinental ballistic missiles will soon reduce the achievable warning time



Three types of shelter. Upper left - over the train platform. Right - below the train platform. Lower - under each platform for trains in opposite directions.

Fig. 2 Shelters in Stockholm Subway (Illustration adapted, courtesy of The American Swedish Monthly (Ref 5)).

to a matter of minutes. Therefore, tactical evacuation has only limited temporary value in the passive-defense system.[1] Nevertheless, a great deal of confusion has resulted from the attempts by some people to propose tactical evacuation as the central countermeasure—as a cheap substitute for adequate shelter. Regarded in its proper role as a useful peripheral countermeasure, tactical evacuation can be valuable in reducing casualties where it is practicable, but it should never be regarded as a substitute for shelter as the central countermeasure in the emergency phase.

3.5 Central countermeasure in the operational recovery phase

3.5.1 Selection of the central countermeasure

The central countermeasure for operational recovery appears to be reclamation.[2] Reclamation has essentially universal application to targets. Specific measures range from extremely simple techniques of modest effectiveness, such as plowing or fire hosing, to rapid and highly effective devices, such as the shipboard washdown countermeasure. The washdown system demonstrates the high feasible effectiveness possible in reclamation.

3.5.2 Other countermeasures in the operational recovery phase

Important peripheral countermeasures in the operational recovery phase of radiological defense are shielding and the adjustment of operating procedures.[3] In the broader area of atomic defense, repair of physically damaged facilities, replacement of facilities damaged beyond repair, and relocation of functions in undamaged areas are also important. The relationship of these countermeasure types is shown symbolically in figure 3.

In radiological defense, shielding is synonymous with shelter. While shelter is the central countermeasure in the emergency phase, its role in the operational-recovery phase appears, in most instances, to be peripheral. Unless the ultimate in shelter during the emergency phase has been achieved—that is, the placing of industry underground or other means of protecting the normal work area—shielding is applicable in operational recovery to limited situations where the work area is relatively small and the placement of heavy temporary shielding is acceptable. The limit on adjustment of operating procedures, such as work shifts and personnel rotation, is primarily one of cost. Large numbers of additional trained personnel are required to achieve significant improvements in mission entry time. Since trained manpower is at a premium in wartime, and particularly after atomic attack, adjustment of operating procedures is rarely a satisfactory solution to operational recovery. When used with the central countermeasure, these peripheral countermeasures can be very important in building an optimal countermeasure system, as shown in the planning sections of reference 3. The same holds for tactical targets, such as ships, where the taking of shelter in the emergency phase, coupled with the washdown reclamation measure and rotation of topside crews, results in a highly effective radiological-defense system.

In atomic defense, repair of damaged facilities is an important countermeasure. In the broadest sense, repair could be considered a part of reclamation. In contaminating atomic attack, damage to facilities occur, but the damaged region is also radiologically contaminated. Therefore, repair depends upon effective reclamation countermeasures, if early recovery is the objective. This dependence makes repair a peripheral countermeasure. Since the damaged region constitutes only a part of the contaminated region, operational recovery does not always entail repair of facilities.

3.6 Central countermeasure in the final recovery phase

As indicated before, the final recovery phase has not received much study until recently. As a result, the possible countermeasure types are not clearly understood. This makes a decision on the central countermeasure impossible at this time. Since the objective of this phase is to regain normal functions, many

---

[1] Hon. Val Peterson, Federal Civil Defense Administration Chief, in a speech before the Helicopter Association of America in San Francisco on January 24, 1956, stated: "Today we can give warning of an attack in time for evacuation of the city, but when the guided missile is fully developed then it will be a case of 'take shelter where you can.'"

[2] Reclamation is used here to include not only the removal of radioactive contaminants from target surfaces by means of decontamination but also the burial or covering of the contaminant. In general, it includes all operations on the contaminants itself to reduce the radiation field. This is in acocrd with the usage in reference 3.

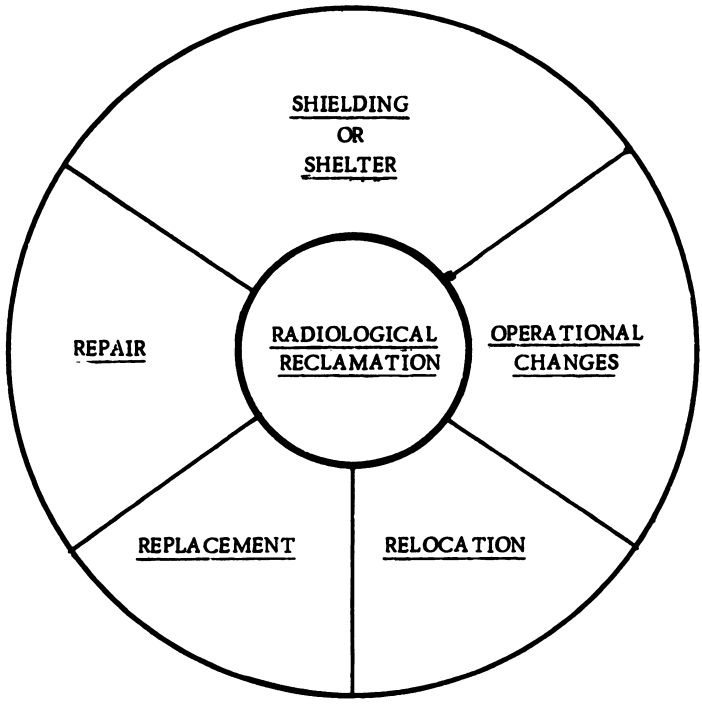


Fig. 3 Countermeasure System in the Operational Recovery Phase

countermeasures such as excluding people from contaminated areas do not appear useful. Shelter also appears to have limited value. Reclamation may be useful but the process of reducing contamination levels over large areas to very low amount appears to present great difficulties. There are some forms of exposure control, such as dilution or natural concentration, which may prove to have the central characteristics required in final recovery.

3.7 Summary of defense system by phases

To minimize the effects of contaminating nuclear attack on operations, we have seen that a time-phased process of survival, early recovery of essential functions, and ultimate recovery of normal functions will be required. In the first phase, primary dependence must be placed upon adequate shelter. Associated with this central countermeasure and its tacitly assumed existence will be a number of important peripheral countermeasures which include dispersal, reduction of vulnerability, and damage-control actions. In the second phase—the early recovery of essential functions—the central countermeasure will be reclamation of the vital area of the target, supported by the use of shielding and the adjustment of operating procedures. In the third or final phase, the ultimate recovery of normal functions will involve one or more forms of exposure control, supported by reclamation and other countermeasure types. An indication of this general system is shown in figure 4.

It is important to note that, in most cases, a given countermeasure type may have value in more than one phase of radiological defense or perhaps in all phases. This is particularly true of the central countermeasures. It must be emphasized, however, that the principal utility of a countermeasure type is associated with a single phase and its specific objective. For example, reclamation is the central countermeasure in the operation recovery phase; however, it is no more than a peripheral damage-control action in the emergency phase and, except in some tactical situations, is likely to be of marginal value in limiting casualties. Reclamation will also be of use in the final recovery phase, but the tremendous effort involved in the clearing of very large areas to extremely low radiation levels does not promise it a central status. In

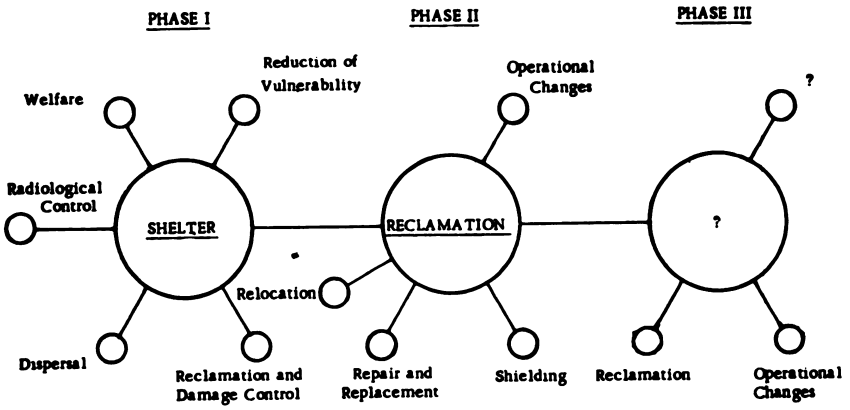


Fig. 4 General System of Radiological Defense

the same way, shelter is central in achieving survival but is considered to be more limited in early recovery of essential functions in most instances. Not being a part of normal operations, shelter has minor value in final recovery. Much confusion is caused in radiological defense by discussing a countermeasure in the wrong context; as in giving great weight to reclamation in damage-control operations in the emergency phase where such weight is not warranted.

SECTION 4. INTERACTIONS IN THE COUNTERMEASURE SYSTEM

The foregoing discussion of radiological countermeasures and their place in a radiological defense system contains nothing startling. The framework presented is of principal value as a starting point for the consideration of the interactions of the defense phases and the countermeasures of primary importance in each. The recognition of the existence of these interactions is an essential step in dealing with radiological defense as a coherent system rather than as an assemblage of individual countermeasures.

It should be recalled that nuclear radiation is of military importance because it is a casualty-producing agent. The dominant fact in radiological defense is that each person has a finite amount of radiation exposure he can sustain before he becomes a casualty. The absolute value of this exposure varies somewhat from individual to individual. Because of the ability of the human body to recover partially from radiation received over a period of time, the limiting exposure cannot be measured directly in roentgens or a similar unit. However, general agreement exists that exposure distributed over a period of time can be interpreted by means of one or more suitable recovery equations in terms of an equivalent short-term exposure. The concept of damage dose has also been proposed as a possible measure of effective biological exposure. The significance of the concept of a limiting exposure in the radiological defense system will be discussed in the following paragraphs.

4.1 Interactions of central countermeasures

Let us consider the specifications of countermeasures in the emergency phase. The central countermeasure is adequate shelter. The question of interest is: What is adequate shelter? If this problem is considered wholly within the emergency phase, the answer is relatively simple. The optimum shelter is the cheapest shelter that assures survival under atomic attack, survival being defined in appropriate terms. Over most of the region of interest in contaminating atomic attack, protection against fallout radiation will dominate the shelter requirements. If shelter specifications are based entirely upon the objective of survival, personnel in shelters at the end of the emergency phase will have survived, but a great number of persons will be at or near the casualty threshold. It is clear that our population will be in a trapped state; they will have survived the attack but they will lack the reserve of radiation exposure necessary to embark on the operational-recovery phase. If recovery is to occur, these people must be removed from the area, and operational recovery and operation of the essential target functions must be conducted with new personnel from an area that has not undergone attack. These actions may be very diffi-

cult to carry out, if not impossible, and it certainly does not represent an effective solution to radiological defense.

Again, let us look at the specification of countermeasures in the operational-recovery phase. The central countermeasure is reclamation. As shown in reference 3, reclamation measures are selected to achieve a satisfactory mission entry time for operation of essential functions. Radiation exposures of both recovery crews and mission personnel are usually kept below the casulty threshold. But, in general, little or no consideration is given to exposure history in the emergency phase. Reference 3 does suggest that 100 roentgens of the acceptable distributed dose be reserved for emergency-phase exposure, but no attempt is made to compute the probable exposures in existing or contemplated shelters. The tendency in development of operational-recovery phase measures is to assume that protection in the emergency phase has been perfect. Unfortunately, the development of emergency countermeasures has generally proceeded independently of any requirements for subsequent radiological exposure. Very often, therefore, it can be clearly seen that the development of radiological countermeasures is being pursued on completely incompatible grounds. The interaction between countermeasures is being ignored.

What is needed is a systems approach to radiological defense. Rather than consider shelters as a separate matter from decontamination, we must seek the cheapest countermeasure system that meets the requirements of both phases. Looked at this way, it appears that it may be cheaper to make our shelters more effective so that we can use relatively simple and available reclamation equipment such as the fire hose and scrub brush. Certainly, unless perfect solutions to operational and final recovery are found, shelters should not be designed for bare survival.

In like manner, the problems of final recovery must be faced. The closest approach to the final recovery problem is the present AEC peacetime permissible exposures, which are quite low. As low as they are, these exposure limits are based on exposure of a limited portion of the population over a long-term period starting with little or no previous exposure. If the countermeasure system satisfactorily achieves the objectives of the emergency and operational recovery phases but results in a large part of the population reaching the final recovery phase with a massive radiation-dose history, must not subsequent permissible exposures be even lower than the present peacetime regulations? Such requirements may make exposure control technologically infeasible. Information on these problems is sparse. However, it should be clear that the optimum countermeasure system must produce the cheapest and most feasible answer to all three phases, if the overall objective of radiological defense is to be met.

4.2 Other interactions

The foregoing discussion has tended to emphasize interactions following the chronological sequence. It has been pointed out, for example, that the capabilities of countermeasures in the emergency phase form the boundary condition for the feasibility of countermeasures in the operational recovery phase. If shelter criteria are based on bare survival, the operational recovery problem becomes virtually impossible. It should be clear that interactions exist in the opposite direction. If highly effective operational recovery measures exist, they may lessen the performance requirements in the emergency phase. The clearest example of this interaction lies in the shipboard washdown countermeasure. This measure not only achieves rapid operational recovery but has a significant effect on the requirements for shelter in the emergency phase. Part of this effect is because the washdown countermeasure, in order to achieve its effectiveness in operational recovery, must be operated during the emergency phase. Washdown therefore contributes directly to the protection of personnel. The existence of a highly effective reclamation measure in operational recovery also can exert an indirect effect on the countermeasure requirements in the emergency and final recovery phases as discussed in the following paragraph.

4.3 The problem of optimum allocation of exposure

The interactions that have been briefly reviewed in the foregoing paragraphs result primarily from the fact that people can undergo a limited exposure to nuclear radiation before unwanted biological effects result. Each countermeasure, no matter what its place is in the defense system, draws a certain amount from this limited account. If we spend heavily in one phase, we must conserve greatly in the others. The optimum defense system is the cheapest and most feasible set of countermeasures that does not overdraw the account. Therefore, an alternative way of looking at the radiological defense system is to regard it as a problem of optimum allocation of radiation exposure to the three

phases. The operational requirements for countermeasure performance in each phase may be set by allocating a portion of the total desired exposure to each phase. This does not simplify the systems solution any, but it does emphasize the limiting parameter. It also brings to the attention the fact that the foregoing discussion is confined to a single experience with contaminating nuclear attack. If it is desired that the countermeasure system permit personnel to undergo two or more nuclear attacks, the allocation of exposure must be made accordingly and the requirements placed on countermeasures will increase.

Thus it appears that the measures of effectiveness indicated in paragraph 2.3 must be handled cautiously. They are useful only within the given phase. A simple measure of effectiveness for the total radiological defense system has not been elucidated as yet and may not exist. For this reason, the simple measures of effectiveness will continue to be used. An understanding of the larger system and careful attention to the boundary assumptions in each phase must be used to avoid serious pitfalls.

SECTION 5. CONCLUSIONS

From this preliminary attempt to view radiological defense measures as an integrated countermeasure system consisting of three basic time phases, and from consideration of the critical interactions of the whole system, it seems evident that radiological defense measures—and atomic-defense measures in general—are being developed individually rather than as an integrated system. As a consequence, these measures, while ostensibly capable of achieving a local objective, were very often based on assumptions so incompatible that it is difficult to see how the overall passive-defense objective can be achieved.

Most passive-defense concepts have been inherited from experience with conventional weapon attacks, such as high explosives and incendiary bombings. The use of the atomic bomb at Hiroshima and Nagasaki forced major changes in passive-defense thinking. The existence of weapons a thousand times more powerful than previous high explosives made dependence on self-help damage control unrealistic. Organization of area resources for mutual aid became extremely important. But emphasis was still placed on emergency phase measures. The later problems of operational and final recovery were concluded to be separate and distinct problems to be handled more routinely by other than passive-defense forces.

The advent of the superweapon was another thousandfold increase in the power of attack. The impact on passive-defense thinking has only recently begun to be felt. The tremendous radiological capability of superweapon contaminating attack has opened new vistas of weapons employment. In radiological defense, the conclusions are clear. We can no longer delay the integration of radiological defense measures into a consistent countermeasures system. The later phases of the problem will not take care of themselves or be taken care of by routine actions. The selection of countermeasures and the specification of countermeasure performance must be conditioned by the defense capabilities that precede and follow the particular measure as well as those that are more closely associated with it.

It is clear also that, as the attack capabilities increase, the defense must concentrate its limited resources on those central countermeasures that have the feasible effectiveness and range of application necessary to assure a consistent payoff in minimizing the effects of attack.

Approved by:

EUGENE P. COOPER,
Associate Scientific Director.

REFERENCES

1. United States Navy Passive Defense Manual, OpNav Instr 3440.6, Office of the Chief of Naval Operations, 26 May 1955.

2. Laurino, R. K., A Suggested Framework for the Study of Atomic Defense Measures, U. S. Naval Radiological Defense Laboratory Technical Memorandum No. 36, 20 April 1955.

3. Radiological Recovery of Fixed Military Installations, Army Corps of Engineers and Bureau of Yards and Docks, NavDocks TP–PL–13, August 1953. Also Air Force TO 00–110A–8, 30 October 1954.

4. Instruction Guide for Shipboard Atomic Defense, 1953, NavPers 10886, Bureau of Naval Personnel.

5. Stockholm's New Subway Atom Bomb Shelters, The American Swedish Monthly, vol. 47, No. 1:6, January 1953.

EXHIBIT 4

PASSIVE DEFENSE PHILOSOPHY AND PRINCIPLES OF DAMAGE CONTROL IN ATOMIC ATTACK ON SHORE ESTABLISHMENTS

United States Naval Radiological Defense Laboratory Report, USNRDL-450, NS083-001, September 1, 1954, by W. E. Strope

Military Applications, Technical Objective AW-5c

Military Evaluations Group

W. E. Strope, Head

Scientific Director, P. C. Tompkins

Director, Capt. R. A. Hinners, United States Navy

UNITED STATES NAVAL RADIOLOGICAL DEFENSE LABORATORY

SAN FRANCISCO, CALIF.

ABSTRACT

This report presents a statement of passive-defense philosophy in atomic attack and of the principles of damage control after attack, with specific reference to the Navy's shore establishments. Since the radius of action of atomic and thermonuclear weapons is large compared with the dimensions of most shore establishments, a system of mutual aid among activities is mandatory. A dynamic and flexible plan of action after attack is presented which is believed to offer the best promise for effective damage control. The plan consists of a two-perimeter system based on a cellular defense organization, and is designed to be operable over a wide range of possible atomic attacks. It is urged that the plan be extended to include the sister services and civil defense.

The saving of lives and property is emphasized as the major objective of passive defense. To achieve this goal, attention is directed toward:

(*a*) Providing a system of mutually supporting passive-defense units capable of operating quickly and effectively in damage control.

(*b*) Providing a system to control and protect personnel under attack conditions. The importance of control of individual actions is stressed.

Emphasis is placed on the necessity for regarding the passive-defense organization as a cadre group requiring leadership training.

ADMINISTRATIVE INFORMATION

This work was assigned by Bureau of Ships letter ND/PRNC/P11 (588) serial 588-269, of June 16, 1953, and was performed under problem 323.4, Research and Development Board Project NS083-001, task 2, project 3, problem No. 4 for the fiscal year 1954.

SECTION I. INTRODUCTION

1.1 Importance of Passive Defense

The use of atomic weapons has raised a severe challenge to national defense. The scale of destruction which can be expected, together with the increasing capability of the potential enemy to deliver these weapons into the zone of the interior, make an effective defense of utmost importance.

Defense against enemy atomic attack could take several forms. Much consideration has been given to creating a capability for "massive retaliation" as a deterrent to potential aggression. Active defense measures, including radar and ground-observer detection and rapid interception of attacking weapon carriers, are also under intensive development. As a third element in national defense, passive defense cannot be overlooked.

If massive retaliation is not a sufficient deterrent and, if, as seems likely, active defense measures cannot eliminate the approaching planes or missiles, this Nation's ability to continue after atomic attack will depend to a considerable extent on the effectiveness of passive defense. Within the continental limits of the United States, the Department of Defense, and more specifically the Navy Department, has many important industrial and logistical organizations which may be affected. Thus in time of war, passive defense may be essential to the fulfillment of the mission of the naval shore establishment.

1.2 Background and Purpose of Report

A considerable amount of study has been applied at United States Naval Radiological Defense Laboratory to the problems of passive defense against atomic attack. The basic two-perimeter defense plan was developed in 1950 in the process of preparing the basic material for volume II of the series Radiological Defense under the sponsorship of the Armed Forces special-weapons project. Additional studies have been undertaken since.

The following sections represent a summary of the principles of action developed to date. This summary was prepared in response to a request by the Bureau of Ships to review a current passive defense directive and to comment on "major areas of passive-defense philosophy rather than on details." The material in this report has been transmitted to the Bureau of Ships and the Chief of Naval Operations in letter form. It is presented in report form here in order to permit broader use among persons concerned with passive defense matters.

1.3 Preview of Report

Based on fundamental considerations of the nature of atomic attack, a dynamic and flexible plan of passive defense is proposed. The major objective is considered to be the saving of lives and property in order to minimize the effect of attack on operations. A "pick up the pieces" approach involving welfare and rehabilitation functions is deemphasized. To achieve the objective of saving lives and property, emphasis is directed toward:

(*a*) Providing a system of mutually supporting passive defense units capable of operating quickly and effectively in damage control.

(*b*) Providing an adequate system to control and protect personnel under attack conditions.

SECTION II. PASSIVE DEFENSE PHILOSOPHY IN ATOMIC ATTACK

2.1 Definition of objective

Passive defense is here defined as all measures taken in defense of a place, without employment of active weapons to forestall delivery of the attack. Measures taken prior to attack include protection, deception, dispersion, and concealment. Measures taken after attack include damage control and recovery or rehabilitation. The purpose of all such measures is to minimize the effect of the attack on the target mission by reducing personnel casualties and damage to material.

2.2 Basic considerations

The basic fact arising from atomic attack is that the radius of action of the weapon's effects is large compared with the dimensions of most naval shore establishments. It is a fallacy to regard an atomic detonation as occurring within the confines of the naval installation. Rather, the naval installation must be regarded as being within the area affected by the atomic detonation. The logical consequences of this consideration are:

2.2.1 Requirement for mutual aid

It is highly improbable that the individual naval installation can cope with the effects of an atomic attack—particularly of a direct hit—without outside aid. A damage-control plan which attempts to answer the question, What will we do if we are hit by an atomic weapon? is ill conceived if the plan considers only the internal resources of the installation. Some effective system of mutual aid among installations is essential.

2.2.2 Requirement for district planning

As a result, the primary planning for atomic defense must be done on an area basis at the naval-district or river-command level. For atomic attack, the "White" plan must define defensive action in greater detail than for more localized emergencies, and must successfully coordinate the defensive resources of the entire district or command. This coordination and unity of plan for defense against the atomic attack must extend to the parallel Army and Air Force plans within the framework of directives of higher authority with respect to joint defense actions. (Where installations are located in an urban-industrial complex, it is very desirable that civil-defense efforts be conducted according to a similar plan and be coordinated with military efforts.)

72796—56—pt. 6——34

2.2.3 Dispersal of facilities and personnel

In regard to measures to be taken prior to attack, the dimensions of atomic detonations require that dispersion be seriously considered as a countermeasure. The dispersal of facilities over large areas is an efficacious means of minimizing the effect of atomic attack on naval missions. The dispersal of personnel in time should also be considered. Such dispersion employs work shifts to assure that only a portion of the work force is exposed to attack at any one time. Personnel attached to naval installations are generally skilled personnel, not easily replaced, especially in wartime. Measures to preserve the work force will probably constitute a prime goal for the defense efforts of most installations. Since dispersion often has an adverse effect on operations, the advantages and disadvantages must be carefully weighed, often at the district level or higher.

2.2.4 Damage control

With regard to damage-control measures after attack, three elements of the passive defense organization can be described:

(*a*) An external organization, concerned with mutual aid among installations and hence mobile.

(*b*) An internal organization, concerned with self-help and hence relatively static.

(*c*) A command function, concerned with control, coordination, and communications.

Each of these elements must be properly developed by the district "White" plan and by the damage-control plans of subordinate units.

2.3 Assumpations regarding attack situations

A fundamental requirement of any passive defense plan is that it must be sufficiently flexible to deal with the range of situations in which it proposes to be effective. In atomic defense planning, there are certain assumptions regarding the general attack situation that cannot be made restrictive without infringing upon this requirement of flexibility. These assumptions are:

2.3.1 Yield of weapon

Passive defense measures must be independent of the size of atomic detonation. We do not know the yield of the enemy's operational weapons. However, the United States is understood to have a family of weapons of many yields, ranging from very small to very large weapons. It is probable that the enemy has an equal range of choice. It appears to be particularly undesirable to harness passive defense thinking to the so-called nominal atomic weapon of 20-kt. yield. In general, the use of specific ranges of effects is to be avoided. It is sufficient to plan on the basis that the dimensions of the affected area will be measured in terms of miles.

2.3.2 Type of attack

The effects of atomic weapons differ widely, depending upon whether the detonation occurs in the air, at the surface of the ground or water, or under the surface of the ground or water. For air bursts, destruction by air blast and fires are the principal effects in the target. Surface and subsurface explosions cause high local destruction and a radiologically contaminating event. Passive defense measures must cope with all types of atomic attack of which the enemy is capable. An important principle in planning is to not assume that the affected area is circular or symmetrical, or that it is necessarily defined by visible damage. Winds and terrain features may make fire and contamination patterns highly directional. Further, passive defense forces may encounter radiological conditions which limit operations in regions which appear to be undamaged.

2.3.3 Number of weapons delivered

Most studies of atomic weapon attack on this country predict multiple weapon attacks. Passive defense at the district level should be based on the probability of several weapon detonations in each attack. This assumption will dictate a fluid passive defense system but should not affect techniques.

2.3.4 Point of attack

Passive defense systems based upon an assumed point of attack are static systems. As such, they are usually unable to function properly if the attack occurs elsewhere. To determine the probable point of attack, one must estimate the enemy's intentions in conducting the attack. Such estimation is questionable. Furthermore, the attack is subject to considerable error in delivery, depending

upon the delivery means and the effectiveness of active defense measures. For these reasons, passive defense systems should not depend on any assumed point of attack. The system should be applicable to any postattack situation from maximum to minimum severity.

2.3.5 Time of attack

Passive defense must be on a 24-hour-a-day basis. Since many installations will be on an 8-hour day for the majority of personnel, effective mobilization in off hours must be carefully considered. Plans at the district level should indicate what defense elements are available at any or all times.

2.3.6. Warning of attack

Warning of attack is extremely important to passive defense. Presumably all practicable measures will be taken to insure warning. Nevertheless, passive-defense plans should be independent of the existence of warning; that is, a high degree of readiness should be developed in the no-warning condition.

2.3.7. Central control at district level

An adequate control center at the district level is an essential element in effective passive defense. Arrangements must be made, however, for the rapid execution of passive-defense measures in the event that the control center is destroyed or fails to function for any reason. Care should be taken not to assign command responsibilities to the district level at very early times after attack before sufficient intelligence is available to permit exercise of command. In particular, the initiation of defense measures, such as mutual aid, by individual installations should not require a "request" from the district control center.

2.4 Necessity for speed in damage control

Time is vital in passive defense. Measures tardily undertaken will probably be ineffective. Preattack measures must be independent of warning, or must minimize the required warning period. Any shelter program must face these requirements. Damage control efforts—such as firefighting, rescue, and the like—must be undertaken very quickly after the detonation in order to be fully effective. Present information indicates that initial mutual-aid groups from outside the affected area should be operating at the scene within 15 to 30 minutes after burst, and that defense elements arriving at the scene more than about 2 hours after burst will be relatively ineffective as compared to earlier efforts to establish control of the situation. These times are determined principally by the rate of fire spread and by the possibilities of a firestorm or conflagration.

2.5 Necessity for exploitation of all available sources of aid

The scale of destruction in atomic attack is so large that the available manpower and equipment of any passive-defense system will be fully absorbed by an attack of this nature. Operations will be conducted in the face of inadequate local resources and difficult logistics due to the necessity for speed in damage control. Two major considerations follow from this situation:

2.5.1 Passive defense units as cadres

The organized elements of passive defense must be regarded as a cadre organization. This requirement applies especially to the mobile-support or mutual-aid organization. Such organizations must be "open ended" so that small residual groups in the affected area and their established or emergent leaders can be quickly absorbed or coordinated into the damage-control structure. In addition, mobile support elements must plan to enlist or draft able-bodied survivors into the organization at the scene, using the trained personnel of the organization as leaders.

2.5.2 Coordination with other services and civil defense

Passive-defense planning at the district level and higher must emphasize cooperation and coordination with associated and neighboring civilian authorities and military elements of sister services. A common plan of action for damage-control measures is the most effective day to assure such coordination.

SECTION III. PRINCIPLES OF DAMAGE CONTROL AFTER ATOMIC ATTACK

3.1 Basic plan of action

Damage control is here defined as all passive-defense measures taken upon attack or upon warning of attack to minimize loss of manpower and material.

The foregoing passive-defense philosophy emphasizes the need for mutual aid among military installations in event of attack. Therefore, an adequate plan of action is essential to effective damage control ashore. At present, a two-perimeter defense plan based on a cellular defense organization is recommended as the most suitable for district damage-control plans. This plan of action is presented in Radiological Defense, volume II, pages 187 to 193. The basic features of the plan are:

3.1.1 Cellular organization

Each naval activity in the district or river command that is responsible for 2,500 or more military and civilian personnel is regarded as a "cell" in the district damage-control organization. A mobile defense unit is based on each cell. These mobile units are for the purpose of mutual aid. Smaller activities execute self-help measures only, or join in manning the defense unit of an adjacent cell. When an atomic attack occurs, one or more cells may be within the affected area. These cells execute such self-help measures as are practicable under the circumstances. Mobile defense units from cells in the unaffected area immediately move into the affected area to aid in damage control.

3.1.2 Rescue or support perimeter

If cells are well distributed in the area, mobile defense units from unaffected cells will converge on the affected area from many directions. As a unit reaches the edge of the affected area, personnel concerned with certain support functions (control, communications, transportation, medical aid, etc.) are detached to set up a control point, establishing communications with district central control and the home station control center. The ring of control points thus established constitutes the rescue or support perimeter.

3.1.3 Fire or action perimeter

The components of the mobile defense unit that are concerned with fire fighting, first aid, rescue, and radiological monitoring proceed into the affected area until halted by debris that blocks access to wheeled vehicles or by an unacceptable radiological situation. The chief fire official surveys the fire situation and determines a line at which he proposes to hold a conflagration, if such is predicted. This action line is extended laterally to the extent of the forces available or until contact is established with adjacent mobile defense units. Thus is formed the fire or action perimeter. Personnel at the action perimeter establish communications with the control point behind them on the support perimeter, reporting the situation and requesting such aid as appears necessary.

3.2 Operations after attack

The two-perimeter defense plan, just described, divides the area of operations into three zones:

3.2.1 Zone I. Within action perimeter

Zone I constitutes the area within the action perimeter. This area will be severely damaged, with many dead and severely wounded. Nearly all survivors will be injured in some manner. Time is vitally important in zone I because this area is conceded to the incipient mass fires or because radiological hazards are severe. In addition, rapid first aid and removal of injured to medical care will save many lives which would otherwise be lost. No communications will survive in zone I; consequently, no organized effort can be expected from installations in zone I.

3.2.2 Zone II. Between action and support perimeters

Zone II constitutes the area between the action and support perimeters. This area will suffer light to moderate damage. Most personnel will survive although there will be large numbers of injured, especially close to the action perimeter. Zone II is the prime source of panic and spontaneous evacuation. Studies have shown that both military and civilian personnel will tend to flee the area unless a strong internal organization is set up to prevent this action. Although organized units in zone II are the most immediate source of succor to personnel in zone I, the psychological impact of damage and injuries plus the partial or complete loss of communications make it doubtful that positive action can be expected from any but experienced combat units. Therefore, efforts to control the regressive movement of personnel in zone II must have high priority if units from outside the affected area are to be permitted rapid entry. Except for these efforts to forestall spontaneous evacuation, time requirements are not severe in

zone II. Time can be taken to dig personnel from collapsed buildings and to render complex first aid to casualties at collecting stations.

3.2.3 Zone III. Outside the support perimeter

Zone III constitutes that area outside the support perimeter to a depth of perhaps 5 to 10 miles. This area will be undamaged, and all organized mobile defense units should remain effective. Movement of such units into the affected area should occur immediately upon attack. The facility with which the movement is accomplished will depend upon the level of training and the actions of personnel in zone II. At the same time, the internal organization in zone III should prevent all unauthorized movement in the zone and should prepare to support the advanced forces as necessary. Support will take the form of sending additional men and supplies and of receiving wounded personnel, uninjured evacuees, and workers returned for rest and food.

3.3 Limitations on mutual aid

The foregoing plan of operations is most effective when the number of cells involved is large. So long as naval installations alone are considered, the damage-control capability in any area will be low. The weaknesses are threefold:

3.3.1 Limitation of trained personnel

The amount of trained manpower available is small. It is estimated that on the average, 10 percent of the manpower of the installation will be available for the mobile defense unit. Since the smallest installation to man a mobile defense unit is considered to have a total manpower of 2,500, military and civilian, the minimum defense unit will contain about 250 men. A large installation, such as a shipyard employing 10,000 people, would have a mobile defense unit numbering 1,000 men. The total trained force in a naval district may not exceed 10,000 men.

3.3.2 Long distances between cells

The distances between neighboring cells will be large since only a limited number of large naval installations are located in each target area. These large distances would indicate late arrival of mobile defense units at the scene of action.

3.3.3 Varying states of readiness

The state of readiness may vary markedly over the 24-hour period if a significant number of installations are on an 8-hour day with a predominantly civilian work force. Mobilization of the defense unit in off-duty hours will be difficult and time consuming.

The solution of these problems lies in the extension of a common plan of operations not only to the sister services within the target area but also to the civil-defense organization. It appears that the two-perimeter defense plan promises the maximum effectiveness in damage control ashore and warrants development by the naval establishment. Further, the cellular concept eliminates many of the embarrassing and difficult problems of cognizance and control of forces. Mobile defense units based on miiltary and naval installations need not differ in principle from those based on large private industrial plants and on civil subdivisions, such as police precincts or fire districts. There is no need for military defense units to be turned over to civil authorities or vice versa during atomic attack if a joint control center is developed to provide adequate coordination.

3.4 Mobile defense operations

Three basic operating problems face the mobile-defense or mutual-aid portion of the damage-control organization during the period from attack to 12 hours after attack. The detailed plan of operations for any target area should be designed to meet the following problems:

3.4.1 Rapid movement of units

Organized elements must be moved into the affected area rapidly. Initial elements must be at the action perimeter not later than 15 to 30 minutes after burst.

3.4.2 Rapid removal of survivors

Survivors in the affected area must be removed to the support perimeter rapidly. Rapid removal is essential if injured are to be treated effectively.

Organized medical support should be located on the support perimeter Uninjured survivors must be channeled to the support perimeter for control, for organized evacuation of nonuseful persons (elderly persons, children, etc.). and for assimilation of useful survivors into the damage-control effort.

3.4.3 Rapid expansion of forces

The organized work force must be expanded rapidly at the scene of action. This expansion can be accomplished most effectively by drafting useful survivors into work parties at the control points, using the members of the mobile defense units as leaders. The defense units are thus a true cadre organization.

3.5 Self-help operations

The internal portion of the damage-control organization of a naval installatiton is concerned with the protection and control of the personnel who are not a part of the organized mobile-defense force. The need for control of the actions of all persons in the target area cannot be over-emphasized. Lack of discipline or control can convert an emergency into a disaster in a matter of minutes, defeating all efforts at damage control. Since the mobile-defense force is not likely to involve more than 10 percent of the work force, the internal or self-help organization is responsible for the major portion of the work force. The basic requirement is the development of an effective warden system. The normal supervisory organization should be used for this purpose. Supervisors should be trained to take the actions necessary to protect and control the personnel who are normally under their immediate cognizance. The rank and file should be trained to look to their supervisor in case of emergency. The following considerations should guide the development of the internal organization:

3.5.1 Establishment of shelter-assembly points

Adequate shelter-assembly points should be established within the installation. These areas should be carefully chosen to provide the maximum protection possible against the expected attack. If warning of attack occurs, all personnel should retire to the assigned shelter-assembly area. If attack occurs without warning, the shelter-assembly areas become assembly or rallying points for survivors from which controlled action (evacuation or damage control) can take place.

3.5.2 Storage of supplies and equipment

Shelter-assembly points should also be the storage points for first-aid supplies, hand fire-fighting equipment, radiac instruments, and similar emergency equipment.

3.5.3 Communications

All shelter-assembly points should have at least telephone contact with the station-control center, so that command can be exercised. Emergency communication equipment is also desirable at shelter-assembly points if available.

3.5.4 Capacity of shelter-assembly areas

Approximately 50 to 100 persons should be assigned to a shelter-assembly area as a general rule. Large numbers of smaller shelters are difficult to control from a central control point. Larger shelters run the risk of lack of control within the shelter by the senior person present, with resulting panic and loss of control.

3.5.5 Control of personnel actions

Actions of personnel in shelter should be controlled by the station-control center so long as communications exist. If the attack destroys communications, the senior person present in the shelter-assembly point should take the actions necessary to execute local damage control and to evacuate survivors and injured to safe areas. Close control of evacuation is mandatory so that the rapid movement of organized defense units is not impeded.

3.6 Command and coordination of operations

The command function in an atomic emergency should be centralized at a well-protected station-control center. In order to exercise command, the control center must be set up to evaluate the emergency situation rapidly and correctly. To make such an evaluation requires an effective means of acquiring information on the situation, and also requires personnel trained to evaluate this information properly. The communication system is the basic means of acquiring

information. Communications should be developed between the control center and the following:

(*a*) All station shelter-assembly areas.

(*b*) The mobile-defense force, both while moving and when at a control point.

(*c*) The district control center and the control centers of sister installations.

Personnel in the control center must be trained to evaluate fragmentary information correctly and to recommend the appropriate actions to be taken. Since central control depends on effective communications, senior persons in the mobile-defense forces and in shelter-assembly points must be delegated authority to take appropriate action in event of loss of communications.

3.7 Training for passive defense

An important element in implementing these plans is training. Training material for passive defense against atomic attack must be integrated with the foregoing philosophy and principles. In particular, the following points are crucial:

(*a*) Instructions to individuals not assigned special duties must be designed to establish control of actions. Present indoctrination does not lead to establishment of control.

(*b*) Supervisors and other control individuals must be selected and trained to provide maximum protection and control and to instill confidence in personnel that control leadership will preserve lives.

(*c*) All individuals in mobile-defense forces must be trained as leaders, while the manpower sources in the target area must be relied upon to provide the rank and file of the damage-control effort.

Approved by:

PAUL C. TOMPKINS,
Scientific Director.

EXHIBIT 5

AN INTRODUCTION TO DISASTER PSYCHOLOGY

USNRDL Reviews and Lectures No. 4, September 8, 1955, by W. E. Strope

MILITARY EVALUATIONS GROUP

UNITED STATES NAVAL RADIOLOGICAL DEFENSE LABORATORY

SAN FRANCISCO, CALIF.

AN INTRODUCTION TO DISASTER PSYCHOLOGY[1]

By Walmer E. Strope[2]

In 1917 an ammunition ship blew up in the harbor of Halifax, Nova Scotia. The ship contained 3,000 tons of TNT. In the terminology of the atomic era, this would be called a 3-kt detonation. Of course, it was a conventional explosion with none of the radiological implications of atomic attack.

Nonetheless, the blast was devastating to the port city of Halifax. The northern part of the city was destroyed, more than 1,800 people were killed, approximately 20,000 others were injured, and many more thousands were rendered homeless in the dead of winter.

There were several official reports of inquiries into the causes and effects of the Halifax explosion. Sociologists and other scholars also studied various aspects of the disaster. These reports are united upon one fact. They each note with some surprise the magnificent performance of a small group of people, who were among the heroes of the Halifax disaster.

---

[1] From notes of lecture given by author. The lecture notes reproduced herein are based on the research and findings of various investigators in the field of disaster psychology. Acknowledgment is given to these investigators, especially to the authors of the publications listed in the footnotes.

[2] Head, Military Evaluations Group, U. S. Naval Radiological Defense Laboratory, San Francisco 24, Calif.

This group of people quickly went to the aid of the survivors, organizing the first relief station at Halifax. This was in operation by noon of the day of the disaster. Who were these people? And why was their heroism thought to be unusual?

They were a company of traveling actors who were performing at the local opera house at the time of the explosion. In 1917, the acting profession was not considered to be a particularly useful and acceptable part of society. Actors were generally held to be rather peculiar, somewhat irresponsible, and thoroughly self-seeking. Why, then, did a troup of actors becomes heroes when a major disaster visited the city? At the time, no one know. It didn't seem reasonable from any point of view. Therefore, it was put down in the record as one of those fantastic and unexplained occurrences that are part of the lore of all human catastrophes. Let us keep this incident of the Shakespearean actors in mind for a while. We will come back to them a little later and, at that time, I think we will understand why they, rather than anybody else, were the heroes of Halifax.

In the decades since the Halifax disaster, science has developed new theories of human behavior and of social organization. Powerful techniques of analysis have been developed to deal with the problems of group psychology. The results of research in this field by teams of sociologists, psychologists, and other workers have provided a great deal of insight into the general problem of the behavior of people in the midst of disaster. Now we think we know some of the important reasons why some people become heroes and why other people run away. Since this is very important to us in planning a defense against atomic attack, it is proposed to summarize these studies and to apply them to the field of atomic defense.

The first step required in discussing human reactions to disaster is to define our terms. The first question is, of course, What is a disaster? There are a number of possible definitions of this term, but the definition which has been found to be most useful is the following:

DISASTER IS AN UNSTRUCTURED SITUATION

What do we mean by an unstructured situation? Perhaps the best way to arrive at an understanding of this term is to consider first its opposite—the structured situation. By saying that a situation has structure, we mean that there exist certain reference points or facts in the situation that provide one with guides for action. Consider, for example, a conference in the office of the executive vice president of a large manufacturing firm. Attending are representatives of the design, production, and sales departments with their assistants, the purchasing agent, the finance officer, and several members of the executive staff. The question is whether to produce a new model of the company's product. The words and actions of the people present will be guided by the structure of the situation. Each is aware that he is a member of the top management of the company. Each knows his particular position in the organization and the responsibilities and prerogatives which go with it. Each knows the relationship of the other people at the conference to him in terms of superior and subordinate or on parallel levels of responsibility. Perhaps the company's financial position or sales record is part of the structure. The conferees also know that the conference will soon be over, and are laying plans for lunch. They are thinking of the work they have planned for the afternoon. They know that, when quitting time comes, each will travel home, and perhaps they have plans for the evening. This is the structure of the situation, and it is sufficient to guide the actions of all concerned.

Suppose at this point the building should sway violently and the lights should go out. Perhaps the windows are shattered and a sharp shock is felt. These events are unexpected, they do not fit the previous structure. Suddenly plans for lunch or for an evening's outing are meaningless. The topic of discussion, indeed the conference, is suddenly unimportant. Each individual is confronted with a crisis. The burning question is: "What shall I do?" If the emergency is severe, the normal relationships of executive and subordinate and the other social relationships lose their significance. It becomes every man for himself. Since the normal guides for action have disappeared (that is, they no longer seem to fit the situation), we say that we are faced with an unstructured situation. This is what happens in a disaster.

In an unstructured situation, the usual guidelines by which people act, order their thoughts, and consider what they are going to do next, either consciously

or subconsciously, disappear or become manifestly meaningless. People are left, momentarily, at least, as a ship on the wide ocean without a compass, not knowing where they are, nor which way to go. This concept of an unstructured situation is fundamental to a consideration of human reactions to disaster. It will be found at the roots of any disaster, whether it is an atomic attack or a serious automobile accident. Of course, some emergencies are not truly disasters since some structure remains in the situation. In a true disaster, there is no apparent structure.

Psychologists who have studied large numbers of disasters have been able to analyze human reactions to an unstructured situation and have been able to formulate broad statements regarding these reactions. They find that the initial effect of an unstructured situation or disaster on human beings is to render them immobile. The term used for this reaction when a disaster occurs is "stun."

PEOPLE ARE MOMENTARILY STUNNED BY AN UNSTRUCTURED SITUATION

People at Texas City, for example, spoke of being frozen into momentary immobility, of not knowing what had happened, or what to do next. A study[3] of the Texas City disaster reaches the following conclusions: "The shattering of normal expectations by an unexpected even presents the individual with an unstructured, undefined situation in which he does not know what to do." The shock reaction at Halifax has been described[4] as "being suddenly stricken with blindness and paralysis." Some of this sensation of disability and helplessness may be due to physical forces such as blast concussion and the like, but the effect of "stun" is also seen in people who are no subjected to any physical force. It is therefore more probable that it is purely psychological and is to be explained in terms of the unexpected and undefined nature of the situation.

The stun reaction is acutely so common that most readers can recall a personal experience such as a highway accident in which they experienced the momentary sensation of paralysis and helplessness. This reaction has important implications in terms of atomic defense. Common in atomic defense literature are instructions for self-preservation which call for individuals to dive for a ditch or a doorway or to go under a desk or a table when a brilliant flash of light occurs. One is permitted to question, on the basis of disaster psychology, whether these instructions are really useful in reducing casualties, particularly for populations which are neither well trained nor experienced in the face of atomic attack. Certainly, for at least a moment, the first reaction of people will be the immobility caused by "stun."

The next major finding in disaster psychology is that people cannot act in terms of an unstructured situation. It has been shown experimentally that individuals will find structure in a situation even if they must create their own reference points. If the individual finds no reference points on the basis of which he can define the situation for himself, his first move will be to seek one. This is a very fundamental and deep-seated human reaction and can overpower other motivations such as self-preservation.

In the following statement, Logan et al.[3] describe the actions of individuals attempting to structure a situation: "To observers the actions which take place at this time are likely to appear irrelevant and even irrational. In terms of the usual norms and standards of a stable situation, or in the light of later knowledge of what the situation was at the time, they may be irrelevant. But in terms of the limited knowledge available to the actor in the unstructured crisis situation, such actions may be highly appropriate."

It is important to remember that the drive to structure a situation is basic and will override all of the so-called normal referents by which people habitually govern their actions. In combat situations, it is often noted that men will place themselves in jeopardy or actually be killed in an attempt to structure the situation. For instance, when an unexpected event occurs, men will raise their heads out of foxholes or trenches despite enemy fire. They are driven to do so by an unstructured situation.

In one account of a tornado incident, people in a motion-picture house tried to get out into the street, although the theater was obviously the safer location.

---

[3] ORO–T–194, A Study of the Effect of Catastrophe on Social Disorganization, Logan, Killian & Marrs (1951). (The rationale of this paper is drawn from pp. 94–96 and pp. 102–109 of the above reference.)

[4] S. H. Prince, Catastrophe and Social Change, vol. XCIV of Studies in History, Economics, and Public Law, Columbia University, 1920.

A major factor in this move toward the exits was undoubtedly the drive to find out what was happening.

Another example of the drive to structure the situation is found in several accounts of the Texas City disaster. A young woman was trying on a foundation garment in a lingerie shop when the Grand Camp exploded. She rushed into the street in an extreme stage of undress. As soon as she saw that she was in no danger, she was overcome with embarrassment at her situation. Later she repeatedly stated that she couldn't understand how she could have done such a thing. When asked, however, why she ran into the street, she answered simply, "I wanted to see what had happened." In short, she was trying to structure the situation. Her motivation in this respect was able to override her normal modesty so that, in retrospect, she could not understand how she could have done it. Nevertheless, it is obvious that in the unstructured situation in which she found herself, she gave no thought to normal standards and was driven by very strong psychological forces to try to structure the situation.

Returning to the subject of emergency atomic defense actions for individuals, it appears improbable that the office worker will quickly dive under his desk when the brilliant light flashes. More likely, he will freeze for a moment, then turn and look out the window in an attempt to structure the situation. When he does so, he will be staring death in the face. If these casualties are to be avoided or minimized, we must have strong windowless buildings, or else the training given individuals must be sufficiently intensive and realistic so that the situation is immediately recognized for what it is. Such training neither exists nor is contemplated at the present time.

How do people go about defining or structuring a disaster situation? Firstly, individuals must structure the situation on the basis of the information available to them; that is, in terms of what they see, hear, feel, and smell. Secondly, they must interpret or evaluate this information on the basis of their previous experience. If an individual has access to a large amount of information on an unexpected event, a reasonable structure can be obtained quickly based on very little experience. As the amount of information available becomes less and less, either more and more experience and training are necessary to evaluate the situation correctly or, what is more likely, an incorrect structure will result.

Thus it is usual that people tend initially to underestmate the extent of a disaster, since the individual encounters only a fragment of the whole catastrophe. Underestimating is particularly true in the most devastated areas where knowledge is most limited. Leet, in describing the Japanese earthquake of 1923,[5] notes: "A curious psychological twist at such times is the conviction each person has that he is at the center of the worst disturbance. I didn't occur to people in Tokyo that Yokohama was badly affected, or the reverse." He tells of the newspaper publisher who was vacationing in the mountain resourt of Karuizawa at the time. The resort town was shaken but undamaged by the earthquake. The publisher rushed a telegram to Tokyo to hold the presses for a story on the Karuizawa quake. At this time, Tokyo was being destroyed by flames.

Since, in major disasters, individuals usually have a very modest amount of information on the extent of destruction, a heavy burden is placed on their experience and training in order to structure the situation adequately. Most people have no direct experience with atomic attack. We may hope they never have. Unfortunately, they also have practicallly no training to make up for their lack of experience. Therefore, it is likely that for most, the disaster situation will be poorly undertood.

As an example, it was noted at Hiroshima that people put a common structure on the situation. Everywhere people were seen searching for the site of the explosion, each convinced that a large conventional bomb ha been dropped in the immediate neighborhood of his shattered house. This was only natural because the atomic bomb was unknown at the time of the Hiroshima attack. People in the first atomic disaster tended to evaluate what they experienced in terms of what they had previously known or had been trained to know about. Since then, the atomic bomb has been well publicized and in some explosion disasters since the war, many persons have structured the situation as being one of atomic attack. This was noted, for instance, at South Amboy, N. J.

In summary, people structure a disaster situation on the basis of the information available to them and the evaluation of this information whch they can make in light of their experience or training. Since in most cases the informa-

[5] L. Don Leet, Causes of Catastrophe, Whittlesey House, copyright 1948, by the McGraw-Hill Book Co., Inc.

tion available to the individual is very meager, being limited to what he can see in his immediate surroundings, and also since disaster situations are generally outside his experience (and often outside his training), there is a common tendency to assess the disaster in terms of the situation in the immediate vicinity. Such structures generally lead to uncoordinated, divergent, and inappropriate action when viewed in relation to the total situation.

At Hiroshima, there was a complete lack of any coordinated disaster control effort for several days after the attack. We may surmise that one cause of this condition was the inability of the population to structure the situation for what it was. It has already been noted that large numbers of inhabitants of Hiroshima were convinced that a small bomb had detonated in their immediate vicinity. How long did it take before the majority of the population realized that the whole city had been destroyed? How long did it take before people in the zone of light to moderate damage realized that they were not actually "at the center of the worst disturbance," and that there were more seriously affected townsmen nearby who were desperately in need of help?

It is worthwhile to point out that a primary justification for developing a disaster-control organization and for setting up a civil defense or passive defense control center is the need for properly structuring a disaster situation. If a control center is in communication with a number of regions or zones in the target area, it has available to it far more information on the situation than has the ordinary citizen. Even loss of communication with a region constitutes information in the disaster situation. Furthermore, a control center can be staffed with a few persons whose experience and training can be made much superior to that of the average man. These people are then able to evaluate even limited information better and faster than the general population. If an accurate structure of the situation can be disseminated quickly to the surviving population in the target area, the possibilities for appropriate and effective action are immeasurably increased.

We have seen that people are momentarily stunned by the occurrence of an unstructured situation. Since people cannot act in an unstructured situation, the first reaction afer the "sun" is an attempt to structure the situation. Only after the new situation has been structured can a person proceed on some course of action. What do people do when they have structured the situation—rightly or wrongly? They generally act in terms of those personal values which seem to be most threatened.

What these values are varies with the local situation. In the severely damaged area, the individual's life is likely to be endangered, and therefore acts of self-preservation are the rule. Of almost equal importance are the lives of other people in the immediate vicinity. This statement may appear surprising, but it has been observed consistently that in our culture, human life is a fundamental value, one that does not lose its significance even in disaster. It has been found that even badly injured people have acted to help others near them almost as readily as they acted to save themselves.

If a person finds that his own life is not in danger, his next thought is generally for the safety of the primary group with which the individual associates himself. Thus people attempt to find and help the members of their primary group by rushing toward the places where they are believed to be.

It is interesting at this point to consider the difference between a military organization and a civilian community when disaster occurs. Over the centuries military organizations have developed in ways that take advantage of the basic human reactions to disaster. The military organization, of course, finds it highly desirable to encourage the individual soldier or sailor to preserve his own life. In fact, the punishment dealt both adversaries is usually measured in terms of casualties, and any means of minimizing one's own losses or of achieving a favorable casualty ratio with respect to the enemy's is of military importance. Since self-preservation is a fundamental human motivation, military organizations have no difficulty in fostering this reaction.

If the individual is satisfied that his own life is not in immediate hazard, he then is motivated to aid in the survival of his primary group. In the military, the primary group is the squad or platoon or section. So the individual tends to go to the aid of his buddies. The platoon seeks the survival of the company and so on. Military organizations rather carefully insure the development of esprit de corps or group association as an aid in battle. Exeperienced officers always request a unit as a work party, even in noncombat situations. They have found that there is a great difference between a squad and 12 men. In combat, such group relationship are vital. They are important because the psycho-

logical drives of the individuals tend to concentrate on and preserve the organization.

In civil life, we have a quite different situation. Most people regard their family as their primary group, so that the tendency, after satisfying the need for self-preservation, is to try to preserve the family. During the daylight hours when the children are at school, the husband is at work and the wife is at home, the family is widely separated. The psychological drives just discussed do not lead to control of the situation and preservation of the organization. On the contrary, the organization is torn to pieces, with large numbers of people rushing over the countryside looking for their primary group. This human reaction is very strong and can be seen in people who, as will be discussed later, we should expect to forego this reaction.

For example, in a study[3] of a tornado incident in Oklahoma, it happened that the police chief was en route between a neighboring town and his home town at the time the tornado struck. He could see the tornado as it passed through the town and could see that a great deal of damage had been done. Although he had an important role as police chief in such a distaster, his first act as he came into town was to drive to his home and establish that his family had not been affected. Only after this was done did he go to the scene of the disaster and take charge.

Another social group to which many people belong is the work group; people with whom the individual lives and works during the daytime. In most cases, the ties to this group are very strong. If management is aware of these group relationships and acts to utilize them in preparing for atomic defense, it may be possible to strengthen those motivations which will maximize group survival and to minimize those drives which can only lead to disorganization, panic, and additional loss of life.

The foregoing description of human reactions upon structuring a disaster situation is true for most individuals, but it is not true for a very significant minority: people that have been called role persons. The role person is of fundamental importance to atomic defense. What is a role person? He is an individual who conceives of himself as being especially qualified to do some job in the new situation and he tends to act calmly and quickly to do this job in spite of the confusion that prevails about him.

The role which such a person sees for himself in the disaster situation is not necessarily one which he is accustomed to playing in everyday life nor need it be one to which he has been arbitrarily assigned in some disaster plan. It is a role, however, for which he feels himself prepared. It is a role in which he feels that he will be doing something useful, no matter how small. A true role person is convinced that the role he performs is superior to any other action he could take. Therefore, when necessary, he is able to sublimate his fundamental drives toward self-preservation and toward preservation of the primary group.

Many people are role persons because of their background, personality, and training. For instance, doctors are usually role persons. A doctor will generally act to aid the injured with little or no hesitation or confusion when disaster strikes and with litle concern for his personal situation. Public servants such as policemen, firemen, utilities workers, and the like are also probable role persons in an emergency. In all of these cases, the individuals tend to perform the roles for which they have been trained and which they normally pursue in everyday life.

There are however, other individuals who become role persons in a disaster for less obvious reasons. In the Texas City disaster, a minister reacted as follows: "After I heard the explosion, my first impulse was to go down to the docks and try to help there. But when I saw 2 or 3 women whom I knew had husbands down there, I realized that my job was with the families, not doing rescue work. I had a job that I was peculiarly suited for, prepared for and I felt that I should do that." This is a good example of the arising of a role person in a disaster situation.

As another example, a machinist in Texas City stated to the interviewer, "As soon as I had gotten out of the machine shop and realized that there had been a terrible explosion, I went right over to the first-aid station at the plant. You see, I'd had first aid-training and I thought I could be of some use there. I asked if I could help and they said, 'You sure can'. The nurse in charge told me to gather up some supplies, take a truck, and go down to the docks."

---

[3] See p. 2607.

It might be worthwhile to analyze this statement by parts. "As soon as I had gotten out of the machine shop"—Why? He had to structure the situation. "And realized that there had been a terrible explosion." This was the structure he perceived. "I went right over to the first-aid station at the plant." Note the prompt and calm reaction. "You see, I had first-aid training and I thought I could be of some use there." Here was a role for which he felt prepared and which he regarded as superior to any other course of action for him. The fact that he apparently ended up as a truckdriver is of small importance. This machinest saw something to do for which he felt qualified and immediately became an organizing and working influence in the disaster situation.

In many disasters, it has been found that women who have had nurses-aid training reported immediately to hospitals where they believed that they would be needed. One cannot escape the conclusion that very real results could be expected if industrial organizations offered their secretarial help such training as part of the on-plant development program.

From the foregoing examples, it is apparent that there are many people whose usual occupation roles would give no indication of what they should do, but who have perceived that they had other talents that would prepare them for a role in a disaster situation. Perhaps from simple self-inquiry, "What would I do in case of atomic attack"—a role person may result. Such role persons are a very important organizing influence in the face of disaster.

Conversely, much of the confusion in disasters stems from the presence of people who do not know what to do and who can see no role for themselves in the situation. People who tend to panic and who make up the spontaneous evacuation that often occurs after disaster are often of this type. In Texas City, there were people who said, "I didn't see anything I could do here so I left." After a tornado incident, one of the city fathers said, "One of the things that worried me most was that so many people didn't know how to take hold and do something. They didn't know what to do." These are people without roles.

One of the chief characteristics of a role person is that he is able to structure the situation resulting from disaster quicker and better than the people around him. However, he has only the same information that the people around him have. Therefore, his ability to structure the situation must come either from experience or training. Indeed, in civil disasters, many role persons are individuals who have in the past experienced similar events. They are the equivalent of the "combat-hardened" military man. Many role persons are able to structure the situation adequately on the basis of training. This may be a formal training or it may be simply that through reading and through thinking about what he would do if such a situation were to occur, the individual is able to interpret what he experiences in terms of a previously thought out structure.

In this event, the role person is able to act quickly while most of those around him are still trying to structure the situation. When he does so, his actions are noted by the individuals around him and since they are hunting for guidelines for action, what he does forms a basic part of their structure. They note his actions and, recognizing their meaning, are quick to join him in whatever he is doing. People in an unstructured situation have a desperate hunger for a structure and for a clear-cut line of action, so that a role person can quickly become the focal point for the actions of a group of perhaps a dozen people. We might say that persons in an unstructured situation tend to mimic the actions of others. That is, they may not fully realize why the action is being taken, or whether it should be done, but they find themselves drawn toward anyone who apparently knows what he is doing. The role person exerts "silent leadership" in the group and therefore is a powerful organizing influence.

When the city of Flint, Mich., was struck by a tornado recently, the civil-defense director of a small town about 25 miles away drove to the disaster scene as soon as he heard the news. He found a number of citizens bewilderedly surveying the shattered homes in the damaged area. He proposed to search the wreckage for possible survivors and was joined by the standers-by in doing so. The following day State officials surveying the scene noted the activity and asked the workers who had directed them to do the rescue job. The men, pausing in their task, replied that an unknown man who seemed to know what he was doing had started the search the night before and since it seemed a good idea they had continued the effort all night. This is perhaps an extreme example of the powerful influence of a role person on the actions of other.

Unfortunately, the tendency to mimic can also have bad consequences. Where on the one hand the mimicry may be highly desirable because the group is following the silent leadership of a person who is performing a needed role, on the

other hand they may follow a person who is playing a faulty role or who actually has no role at all. Spontaneous evacuation and panic may stem from this cause, where a few people deciding to leave "carry" a much larger group with them. These followers may, under better circumstances, have fitted themselves into a controlled situation.

The Mann Gulch fire of 1949 was a forest-fire disaster in which 13 firefighters lost their lives. They were a group under the leadership of a man named Dodge, who, when it became evident that the group was trapped, set a small escape fire in the meadow. The escape fire created a burned area within which Dodge survived although the rest of the group failed to follow him. The report of the board of review[6] states:

"The evidence is not conclusive as to how many of the crew understood Dodge's purpose in setting the escape fire and heard his directions to join him inside the burned area. The situation was complicated by the noise of the main fire and possibly by the remark of one victim, as heard by some of the men, 'To hell with this, I am getting out of here.' Evidently each individual followed either his own interests at this point or the example of those ahead of him who were making their way up or across the slope."

"Dodge showed coolness and good judgment in setting the escape fire. Both survivors and Sylvia said they believed that all the men would have been saved if they had followed Dodge's lead in getting into the area burned by the escape fire."

This indeed is one of the major problems with which any atomic defense or disaster organization is faced. We know that role persons will arise in the situation. We know that some of these people will be playing roles that are highly desirable. We know that others may be playing roles that are going to increase the loss of life or are likely to interfere with the saving of life by others. A major effort must be made to assure that the roles that people play are those that are the proper ones in the total situation. Such an effort must also include role persons of the highest degree. For example, it has been stated that doctors are generally role persons. They will treat injured persons wherever they find them, irrespective of their own safety or thoughts about their loved ones. But this may not be the role that we would like to have a doctor play. It might be better for him to go immediately to a first-aid collecting station or a hospital where he can treat a vastly greater number of injured in the same period of time and with more effectiveness than he would be able to do in scrambling through the ruins. If this is the case, then the doctor must be trained to the proper role. He must be convinced that the proposed role is the best for him. Once he is convinced of this, it will guide his actions as a role person.

Other examples of improper roles have occurred in civil disasters. In one tornado incident, the police chief, rushing from his home toward his office, stopped on the main business street and became a mere guard, protecting the stores there from looting. The sheriff became directly involved in rescue work as a worker since several branches of his family had lived in the path of the tornado. These men played useful roles but they failed to assume the position of leadership for which they were qualified and which would have resulted in more effective disaster control.

Effective atomic defense will depend in large measure upon the number and type of role persons involved in the emergency. Effective leadership is more important than facilities or equipment. There is rarely anything needed in a disaster area that isn't already there—hardware stores full of tools, acres of abandoned vehicles, grocery stores full of food, department stores, hotels and motels, gas stations full of gas. What is usually in short supply are people who understand the jobs to be done and who do them.

It is interesting that military organizations have developed the role person concept to a high degree, perhaps without realizing it. Compared with civil populations, the military are therefore highly immune to disasters. Not only is the organizaiton able to take advantage of the basic human motivations in disaster, but there is a constant program in the military forces to develop every individual in the organization as a role person. The program starts with basic training and proceeds through successive stages by which men are trained to play particular roles under adverse circumstances.

There are degrees of role persons, and the military recognize this fact. When men are put into the front lines for the first time, the Army is usually careful

[6] Report of Board of Review, Mann Gulch Fire, Helena National Forest, August 5, 1949, U. S. Forest Service.

to intersperse these green personnel among units that have combat experience. In this case, the combat veterans act as role persons and have a controlling influence in the action that ensues.

It would be an ideal state of affairs if an atomic attack we could have every person a role person playing a proper role. At the present time, this is far from the case and perhaps a more practical target should be proposed. As a rule of thumb, it may be said that if one can be sure that 1 person in 10 in a disaster area will act as a proper-role person, then control of the situation and maximum saving of life and property can result. That is, each role person can take with him, on the basis of silent leadership and example, something of the order of 10 other persons who otherwise might be doing nothing, doing the wrong things, or blindly attempting to escape a situation in which they can see no hope. Of course, it would be desirable to have more role persons than 1 in 10. Therefore, atomic defense organizations should aim at creating as many role persons as possible. Only in this way can we be sure that our people will have the maximum chance of survival.

Now let us return to the city of Halifax and the members of the Academy Stock Co. Why were these play actors heroes at Halifax? Whey were they role persons? Regardless of their other traits, actors are trained intensively in playing roles. Each evening they become another person. The degree to which they do become another person indicates their stature as an actor. One cannot know whether these actors had ever acted in a play involving a natural disaster but certainly they were adept at playing roles. When the disaster occurred, it was their natural impulse to play a role. The role they chose as a group to play turned out to be very excellent. Prince[4] says, "Thus it came about that the soldiers, firemen, and play actors may be called the disaster protocracy. They were 'the alert and effective,' the most promptly reacting units in emergency."

Some conclusions with regard to atomic defense are warranted. Certainly one of the principal jobs is to create a large number of role persons and to train them to play the roles that are found to be the most important. While limited numbers of personnel are being organized and trained intensively, the broad base of the population should be indoctrinated with sufficient knowledge to encourage proper structuring of the situation. They should be exposed to the bare essentials regarding emergency action to save life—fighting fires, conducting rescue, and so on.

Existing primary groups at work locations, at home, and at school should be utilized in organizing for atomic defense. Supervisors, family heads, and teachers should be singled out for development into role persons. Their training must be such as to assure maximum protection and control of members of the group and to instill confidence in group members that control leadership will preserve life.

The immediate value of an organization in time of disaster is the ability to structure the situation more adequately and more quickly than the individuals involved. The magnitude of atomic effects makes this function particularly important. Communications are therefore essential to organized atomic defense. If the control center is not provided with the means of acquiring the necessary information on the nature and extent of the disaster, it may form a more erroneous structure of the situation than many subordinate elements or persons who are directly involved. In this event, attempts to control the actions of others will be fruitless. People involved in the disaster will usually ignore nonsensical instructions—instructions which patently are not in accord with the situation.

Of equal importance is the provision of adequate communications for the dissemination of a structure to the whole target population. It is not enough to advise a limited organization while the vast majority of the survivors are forming their own structure and proceeding to act accordingly.

Finally, all disaster organizations should be open-ended; they must not be conceived as a closed corporation. Members of atomic defense organizations should all be trained as leaders. They should be alert to recognize emergent-role persons in a disaster and quick to accept and utilize their valuable efforts. Any disaster plan that depends entirely upon the predisaster organization is a bad plan. The door must be left open for nonmembers to help. When the chips are down, they will help—better than many.

W. E. STROPE.

---

[4] See p. 2607.

×